PART D

Servicing the radio

This part describes the disassembly and reassembly of Tait Orca 5000 handportables and the servicing of some key mechanical and ancillary devices.

Information is also provided on ordering spare parts for servicing handportables.

Contents

Servicing the radio

The manufacturing process does not allow direct servicing access to components on the main PCB. Service repairs of Tait Orca 5000 handportables are therefore limited to key mechanical and ancillary devices associated with the main PCB. These include:

- front panel assembly;
- lens (Orca 5020, Orca 5035 and Orca 5040);
- PTT keypad;
- speaker;
- keypad (Orca 5020, Orca 5035 and Orca 5040);
- LCD display (Orca 5020, Orca 5035 and Orca 5040);
- shield, complete with user interface PCB assembly and polyester dome (Orca 5020, Orca 5035 and Orca 5040);
- main PCB assembly;
- antenna connector;
- channel selector switch;
- volume control switch;
- microphone;
- speaker contacts;
- battery contacts;
- PTT tact switch;
- RF out assembly; and
- auxiliary flexible PCB.

A list of spares kits available for servicing Tait Orca 5000 handportables is shown in Table D-1 on page D-16. These spares can be ordered from your local Tait dealer.

Screw head types

Most of the screws in Tait Orca 5000 handportables are Torx head screws, and so a Torx T6 driver bit is supplied as part of the service kit. When removing screws be sure to use the correct driver.

Torx head 1.8*5 mm screws should be removed using the supplied Torx T6 driver. When replacing these screws, set the driver to 2 inch pounds.

Disassembling the radio

Removing the front panel from the chassis

Unscrew the antenna and detach the battery pack.

Remove the channel selector and on/off/volume control knobs need to removed before separating the front panel and the chassis.

To remove the knobs, insert a side cutter at the base of each knob, flat side down (Figure D-2), making sure not to damage the knob label and the switch shaft. Squeeze lightly; the knobs should pop off. Discard the knobs.

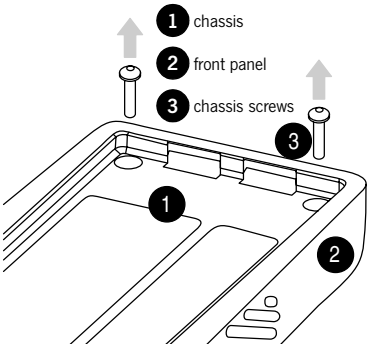
Some earlier Tait Orca 5000 handportables have the knobs glued on. If so, the knob's metal insert will remain on the switch shaft. Remove the insert using a sharp scalpel blade.

Remove the two chassis screws at the base of the radio (Figure D-1), then reattach the battery and hold the base of the radio in one hand. With the other hand, pull the chassis from the front panel using the base of the battery as leverage (Figure D-3).

At this point you can replace the following:

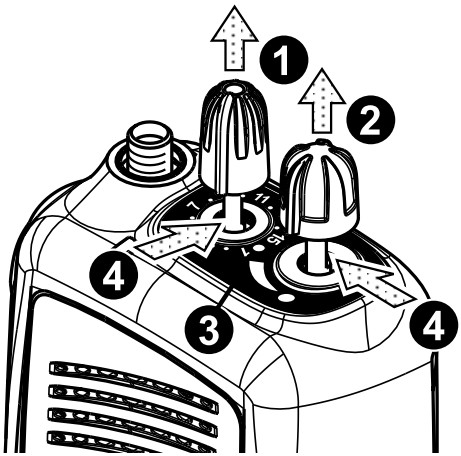
- the front panel assembly;
- the PTT keypad (PTT key and function keys);
- the speaker;
- the lens;
- the keypad; and
- the volume plate and volume keypad.

Figure D-1: Removing the chassis screws



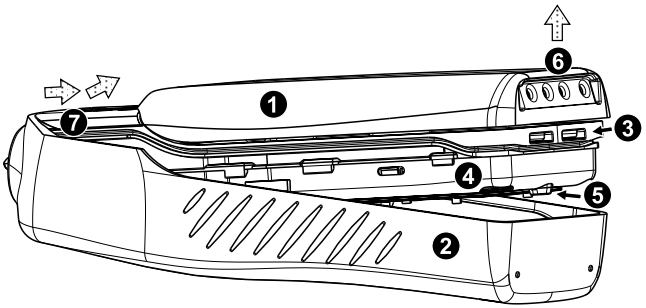
Note that you should not attempt to remove the PTT keypad before removing the front panel from the chassis. See "Replacing the PTT keypad" on page D-8 for more information.

Figure D-2: Removing the knobs



1 channel selector
2 on/off/volume control
3 knob label
4 insert slide cutters here

Figure D-3: Removing the front panel from the chassis, using the battery as leverage



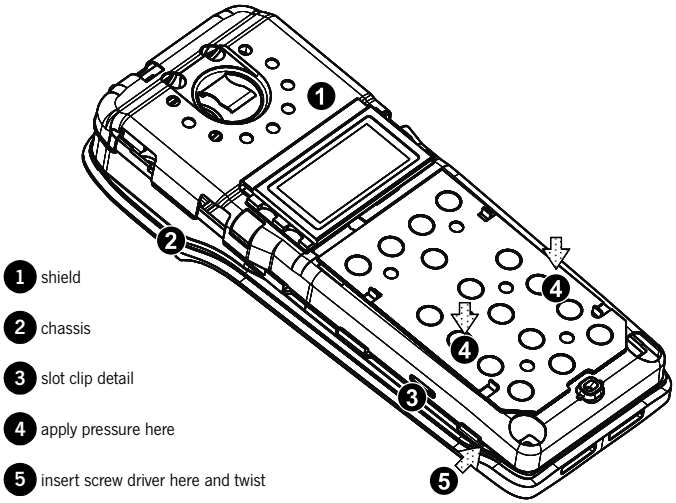
1. battery pack
2. front panel
3. chassis
4. shield
5. microphone grommet protruding from the shield
6. grip battery here, gently pull away from the front panel
7. pull radio out and away from the front panel at this point

Removing the shield sub-assembly from the chassis

To remove the shield sub-assembly, place the radio's internal assembly on a flat surface with the shield side facing up toward you. Press lightly down on the shield sub-assembly above the slot clip detail (shown in Figure D-4), which will slightly bow the shield away from the chassis.

Maintain pressure and insert a flat bladed screwdriver (approximately 4 mm) in the gap between the shield and the chassis. Twist the screwdriver and the shield should rise up over the clip.

Figure D-4: Removing the shield sub-assembly from the chassis



1. shield
2. chassis
3. slot clip detail
4. apply pressure here
5. insert screw driver here and twist

Repeat this on the other side. Remove the microphone grommet by pulling upward (Figure D-5).

You can now see the bottom surface of the PCB. The basic layout of the PCB is shown in Figures D-8 and D-9. Refer to these diagrams for the placement of parts.

Note that on Orca 5020, Orca 5035 and Orca 5040 radios, the user interface loom must be detached from the main PCB before the shield can be separated from the main PCB and chassis.

At this point you can replace:

- the LCD display (Orca 5020, Orca 5035 and Orca 5040); and
- the shield, complete with user interface PCB assembly and polyester dome (Orca 5020, Orca 5035 and Orca 5040).

Removing the PCB from the chassis

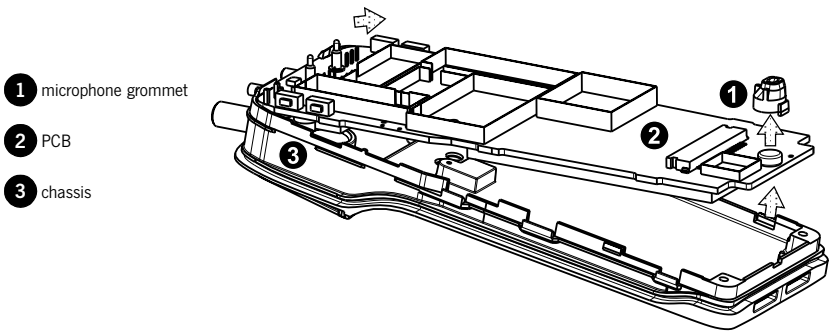
Remove the knob seal, which covers the antenna connector, channel selector switch and volume control switch.

Remove the screw through the PA shield. Remove the three nuts for the antenna connector and knobs using the supplied 8 mm long reach socket driver, then remove the three ribbed lock washers. Gently lift the PCB up to the angle shown in Figure D-5, then pull it away from the chassis.

At this point you can replace:

- the main PCB assembly;
- the antenna connector;
- the channel selector switch;
- the volume control switch;
- the microphone;
- the speaker contacts;
- the battery contacts;
- the PTT tact switch; and
- the RF out assembly.

Figure D-5: Removing the PCB from the chassis



Removing the rear panel

Follow the disassembly instructions and disassemble the radio to the PCB level. Refer to Figure D-10 for the details of the rear panel assembly.

Insert a small flat bladed screw driver under the auxiliary dummy rear cover and apply pressure to push the dummy rear cover lugs free of the holes in the rear panel. To remove the rear panel, either:

- slide the cover forward by pushing at the base with your thumbs; or
- insert a small flat-bladed screwdriver just under the notch in the base and twist.

Remove the rear panel seal. Note that the RF contact pin normally remains in the rear panel seal. Make sure that this is not lost during disassembly.

Using a calibration pin, lift the auxiliary flexible PCB contact area from the lower lefthand corner. Remove the flexible PCB with the seal from the chassis; they should come out as a unit.

You can now replace the auxiliary flexible PCB.

Replacing key mechanical and ancillary devices

This section describes the replacement of key mechanical and ancillary devices associated with the main PCB. These include:

- lens (Orca 5020, Orca 5035 and Orca 5040);
- PTT keypad;
- speaker;
- LCD display (Orca 5020, Orca 5035 and Orca 5040);
- shield, complete with user interface PCB assembly and polyester dome;
- antenna connector;
- channel selector switch;
- volume control switch;
- microphone;
- speaker contacts;
- battery contacts; and
- PTT tact switch.

Note that instructions for replacing the RF out assembly and the auxiliary flexible PCB are included as part of the reassembly instructions.

Refer to Figures D-8 and D-9 for the placement of parts. Once the required devices have been replaced, refer to the reassembly instructions on pages D-13 to D-15.

Replacing the lens (Orca 5020, Orca 5035 and Orca 5040)

You must dissasemble the radio before gently prising the lens away from the front panel of the radio. Remove any adhesive remaining on the front panel.

Peel the paper from the back of the new lens, and place the lens in position on the front panel. Press firmly into position, then remove the piece of clear plastic from the front of the lens.

Figure D-6: Replacing the lens

1 lens

2 front panel

3 gently prise the lens away from the front panel

Replacing the PTT keypad

Following the disassembly instructions, remove the front panel from the chassis.

To remove the PTT retaining plate, from the inside of the front panel, gently push the central latch that holds the retaining plate in place. Be careful not to lose the two pins that act as actuators for the function keys.

To replace the PTT retaining plate, insert the bottom tab into the hole at the bottom of the PTT recess. Bend the PTT retaining plate very

slightly so that the top tab slots easily into the hole at the top of the PTT recess. Be sure not to split or otherwise damage it.

Replacing the speaker

Following the disassembly instructions, remove the front panel from the chassis. The speakers sits in the inside of the front panel (see Figure D-7).

Using a scapel and a flat screw driver, carefully remove the speaker from the front panel. Clean with alcohol any remaining adhesive from the speaker seating. Replace the adhesive ring and secure a new speaker in place. Be sure to align the tabs.

Replacing the LCD display (Orca 5020, Orca 5035 and Orca 5040)

Following the disassembly instructions, remove the shield from the front panel and unplug the user interface loom from the main PCB.

Unplug the LCD display loom from the user interface PCB, remove the LCD display from the shield and discard the LCD display.

Position the new LCD display on the shield, pass the LCD loom through the gap in the shield and plug into the connector on the user interface PCB. Push down the two connector lugs to secure the loom.

Plug the user interface PCB loom onto the connector on the main PCB and push down the connector lugs to secure.

Refit the shield onto the chassis (refer to page D-14 for detailed instructions).

Place the LCD holder over the LCD, fitting the LCD holder locating blocks into the holes in the shield.

Refit the front panel to the chassis (refer to page D-15 for detailed instructions).

Figure D-7: Mounting the speaker in the front panel

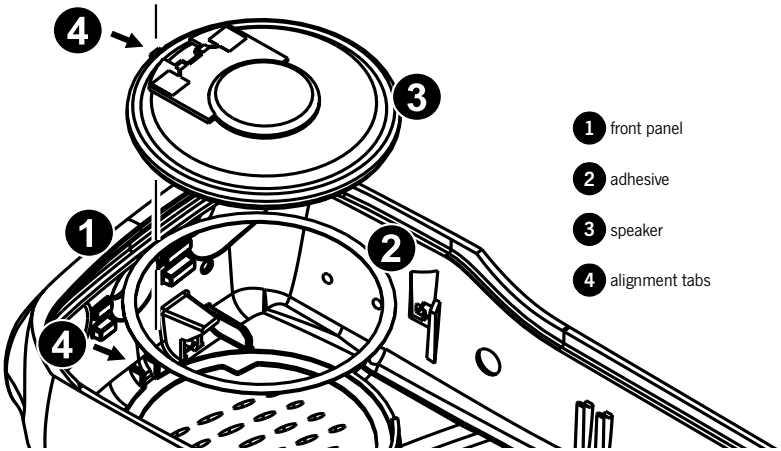
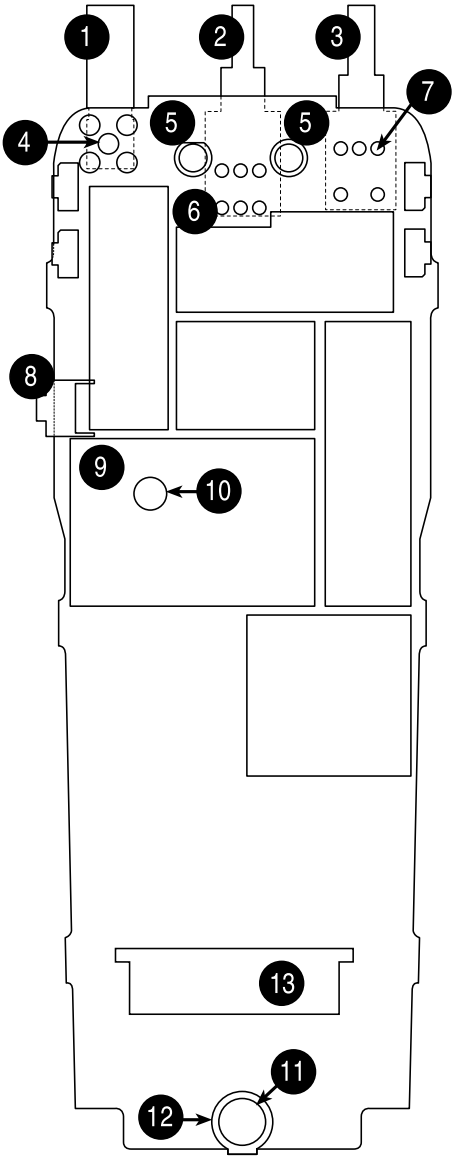
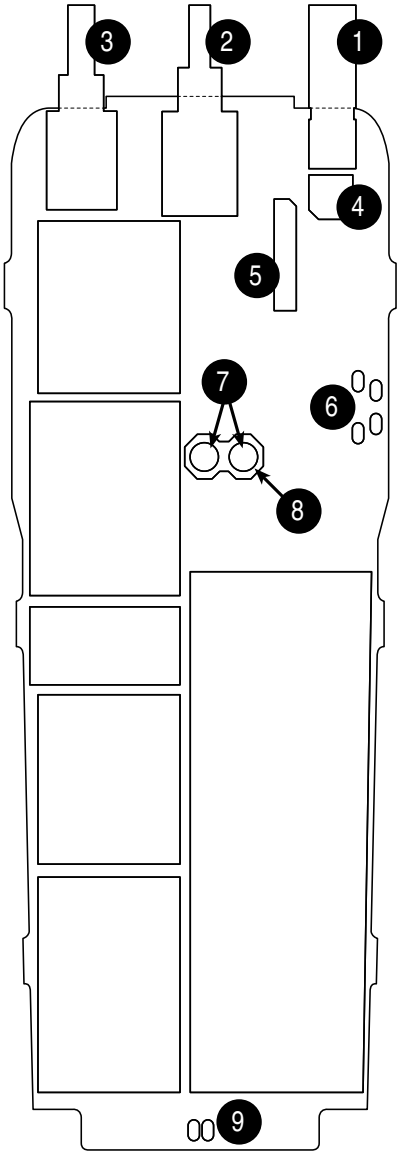


Figure D-8: Bottom surface of the PCB, which is visible when the shield has been removed from the chassis



1. antenna connector
2. channel selector switch
3. on/off/volume control switch
4. antenna connector pin placement (5 pins)
5. speaker contact pin placement
6. channel selector pin placement (6 pins)
7. on/off/volume control pin placement (5 pins)
8. PTT tact switch
9. PA can
10. PA screw
11. microphone placement
12. microphone grommet placement
13. user interface loom connector

Figure D-9: Top surface of PCB, which is visible only when the PCB has been removed from the chassis



1. antenna connector
2. channel selector switch
3. on/off/volume control switch
4. RF assembly placement
5. auxiliary flex socket
6. PTT tact pin placement (4 pins)
7. battery contact placement
8. battery contact seal placement
9. microphone pin placement (2 pins)

Replacing the shield, user interface PCB assembly and polyester dome (Orca 5020, Orca 5035 and Orca 5040)

On Orca 5020, Orca 5035 and Orca 5040 radios the shield, user interface PCB and polyester dome are replaced as one complete assembly.

Following the disassembly instructions, remove the shield from the front panel and unplug the user interface loom from the user interface PCB.

Remove the LCD display assembly from the discarded shield, and fit to the replacement shield according to the instructions on page D-9.

Plug the user interface loom into the connector on the new user interface PCB, and reassemble the shield onto the chassis according to the instructions on page D-14.

Replacing the antenna connector, channel selector switch and volume control switch

Following the disassembly instructions, disassemble the radio to the PCB level. Remove the PCB from the chassis.

If any of the antenna connector, channel selector switch or volume control switch need to be replaced, remove them using a vacuum-operated solder station. Replace them according to the reassembly instructions on pages D-13 to D-16.

Replacing the microphone

Following the disassembly instructions, disassemble the radio to the PCB level. Remove the PCB from the chassis.

Use a desoldering station to remove the microphone. Discard the microphone.

When replacing the microphone, make sure it is aligned with the marks on the PCB, since it is polarised. Refer to Figures D-8 and D-9 for the placement of the microphone.

The microphone should not hang over the edge of the PCB. Solder it in place using a light-tip soldering iron (e.g. Weller PTR7 tip).

Replacing the battery and speaker contacts

Following the disassembly instructions, disassemble the radio to the PCB level. Remove the PCB from the chassis.

When replacing one of the battery or speaker contacts, replace the other contact, even if only one is faulty. If available, use solder paste to replace the contacts.

Note that the contacts are heat-sensitive and will fail if they are overheated.Low temperature solder must be used and the contacts must not be heated above 260°C.

Remove the contact with a soldering iron and discard. Refer to Figures D-7 and D-8 for the placement of the battery and speaker contacts.

Solder the replacement contact in place using a heavy-tip soldering iron (e.g. Weller 2PTCC8 tip). Hold onto the contact with a pair of pliers and apply large amounts of solder to the PCB, rather than to the contact, to avoid damaging the contact.

Replacing the tact switch

Following the disassembly instructions, disassemble the radio to the PCB level. Remove the PCB from the chassis.

Remove the PTT tact switch using a desoldering station or solderwick. Note that there is a lot of solder on both sides of the board, so be sure to remove it all.

Refer to Figures D-8 and D-9 for the placement of the PTT tact switch.

Place the new PTT on the board and solder it in place using a heavy-tip soldering iron (e.g. Weller 2PTCC8 tip).

Reassembling the radio

This section describes the reassembly of the radio once the required units have been serviced. Additional instructions for replacing the following mechanical and ancillary devices are also included:

- auxiliary flexible PCB;
- RF out assembly;
- volume plate and volume keypad;
- antenna connector;
- channel selector switch; and
- volume control switch.

Rear panel reassembly and replacing the auxiliary flexible PCB

Follow the instructions on page D-7 to access the auxiliary flexible PCB, and replace. Push the flexible PCB with seal firmly into the chassis, aligning the notch in the seal with the locating pin on the chassis (see Figure D-10).

The rubber must sit flush with the back of the chassis or the rear panel will not sit properly and the battery will not fit correctly.

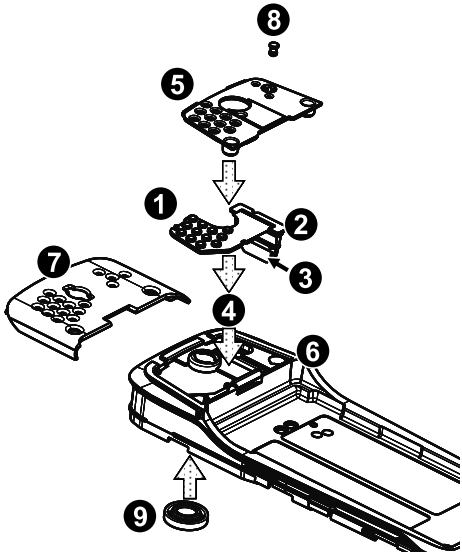
Fold the flexible PCB over and fit the contact area on the chassis; it should fit snugly in place.

Replace the rear panel seal by tucking the two tags at the top of the seal under the lip on the chassis and folding it over the flexible PCB. Check that the RF contact pin is positioned correctly in the rear panel seal, and that the seal is flush with the chassis.

Slide the rear panel on from the top of the radio (Figure D-10). Force it into place by pressing the top edge of the cover against the edge of a table; it will clip home. Make sure the gap between the cover and the chassis is as small as possible. Refit the auxiliary dummy cover by pushing the lugs into the holes on the rear panel. Replace the chassis plug seal, pushing it onto the chassis boss.

Figure D-10: Rear panel assembly

1. auxiliary flex connector PCB
2. auxiliary flex seal
3. end of auxiliary flex connector protruding through the seal
4. make sure the seal and auxiliary flex are firmly seated in the chassis here
5. rear panel seal
6. chassis
7. replace rear panel
8. RF contact pin
9. chassis plug seal



Fitting the PCB to the chassis and replacing the RF out assembly

Put the battery contact seal over the battery contacts rather than into the chassis. If you put the seal on the chassis, the contacts will squash the seal.

Fit the replacement RF out assembly as shown in Figure D-11.

If you have removed the antenna connector or either of the switches, fit them on the PCB (refer to Figures D-8 and D-9), but do not yet solder them in place. Align them with the holes in the chassis, and as you lower the PCB onto the chassis, make sure the accessory flex protruding from the chassis fits into the socket on the PCB. Lower the PCB onto the chassis, making sure it is firmly seated.

Fit the PA screw loosely in place. Align the switches so they are centred, referring to Figures D-8 and D-9 for placement.

Figure D-12 shows the reassembly of the antenna and switches. Replace the washers, making sure the cone faces up. The nuts for the two switches are black.

Replace the nuts, making sure they are threaded correctly before using an 8 mm long reach socket driver set to 10 inch pounds. Then tighten the PA screw to 2 inch pounds.

Using a heavy-tip soldering iron (e.g. Weller 2PTCC8 tip), solder the antenna connector and two switches in place, if required, taking care not to damage the surrounding components.

Replace the knob seal over the antenna connector and the two switches (see Figure D-12).

Fitting the shield to the chassis

Replace the microphone grommet over the microphone.

Replace the shield from the top of the radio, ensuring that the two pins on the chassis go into the two holes at the top of the shield.

Should the main seal need replacing, place the new seal so that the notch at the top of the chassis (behind the channel selector switch) matches that on the seal and the profile matches the chassis.

Run your finger around the seal to ensure that it fits properly into the seal retaining well.

Figure D-11: Placing the RF out assembly

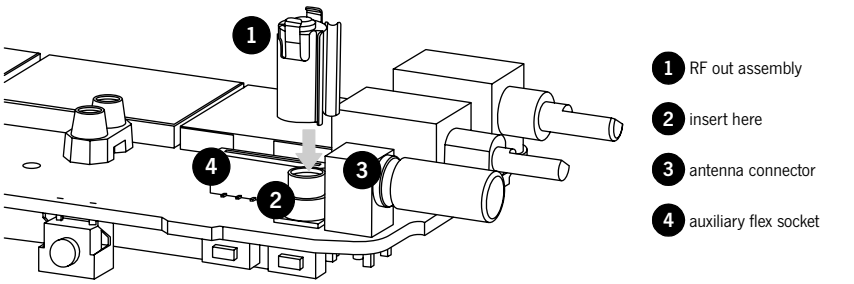
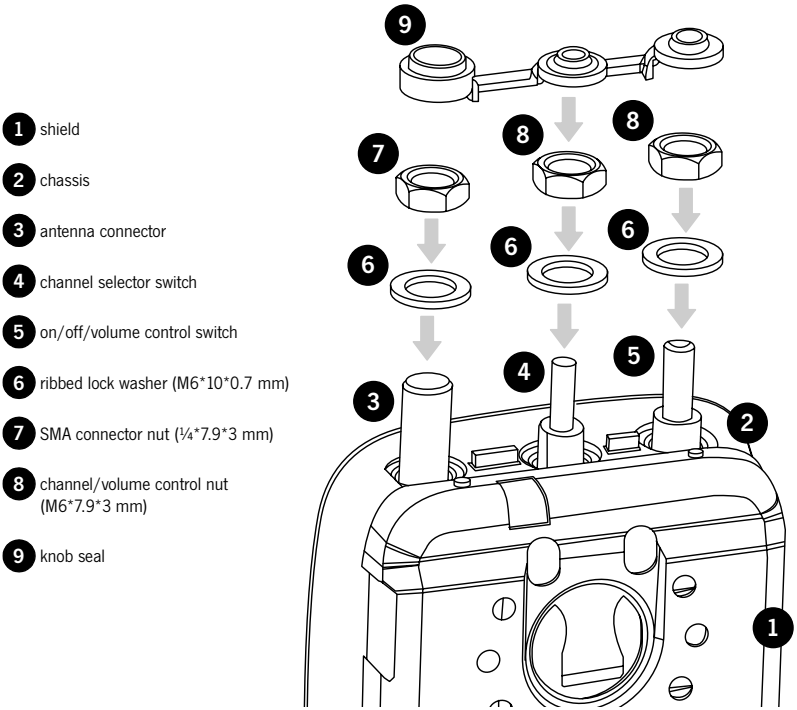


Figure D-12: Assembly of the switches



Fitting the front panel to the chassis

Place the radio into the front panel top first, inserting the antenna connector and knob switches through the holes. Gently ease the radio into the front panel until the edge of the chassis is flush with the edge of the front panel, while making sure that the seal is not pinched; using the battery as leverage as in radio disassembly may be helpful. Replace the two chassis screws at the base of the radio, tightening them to 2 inch pounds.

Replace the two knobs on the radio with new knobs, after placing a spot of Loctite™ 680 on each switch shaft. Make sure there is no gap between the base of each knob and the knob label by firmly pressing the top of each knob against a firm surface. Choose a surface that will not damage the top of the knob.

Spares kits

The following table shows a list of spares kits which are currently available for servicing Tait Orca 5000 handportables. Spares kits are designed to service 100 radios, and can be ordered from your local Tait dealer.

Table D-1: Spares kits

Product code	Description
TOPA-SP-401	Orca 5010/5030 spares kit
TOPA-SP-402	Orca 5035 spares kit
TOPA-SP-403	Orca 5020/5040 spares kit
TOPA-SP-404	Orca 5010/5030 reskinning kit
TOPA-SP-405	Orca 5035 reskinning kit
TOPA-SP-406	Orca 5020/5040 reskinning kit
TOPA-SP-407	Orca 5020/5035/5040 U/I PCB + shield
TOPA-SP-504	Battery catch x 10
TOPA-SP-506	Orca 5000 series volume knobs x 10
TOPA-SP-507	Orca 5000 series channel knobs x 10

The contents of the Orca 5000 low, mid and high tier spares kits (TOPA-SP-401, TOPA-SP-402 and TOPA-SP-403) are shown in Tables D-2, D-3 and D-4. The contents of the Orca 5000 handportable re-skinning kits are shown in Tables D-5, D-6 and D-7.

Note that the 'IPN' column is the ten digit 'internal part number' which uniquely identifies any component used in a Tait product.

The numbers in the 'Reference' column are Figure numbers in which the spares item is shown, and the number in brackets refers to the numbered legend within each figure.

Tait Orca 5000 main PCBs are available on an exchange basis from the Customer Services Division of Tait Electronics Ltd. When ordering, use the following naming convention

TOP-XXXXX-KS.

For example, a replacement main PCB for a TOP-B2620-T0 is a TOP-B2620-KS.

Table D-2: Orca 5010/5030 spares kit (TOPA-SP-401)

IPN	Description	Quantity	Reference
040-05500-08	Volume Control Switch	10	D-8 (3), D-9 (3)
219-50029-00	RF out assembly	5	D-11 (1)
220-01414-03	Aux Flex Connector PCB	5	D-10 (1)
231-00010-45	Channel Selector Switch	10	D-8 (2), D-9 (2)
232-00010-42	Switch PTT (Low Profile)	5	D-8 (8), D-9 (6)
240-02156-01	Antenna SMA Connector	10	D-12 (4)
252-00010-77	Speaker 40mm 0.5W 16E FST	5	–
252-00010-56	Microphone	5	D-8 (11)
316-85133-00	PTT/Function Key Retaining Plate	10	–
360-02019-00	Microphone Grommet/Seal	10	D-5 (1)
303-11213-00	Handportable Chassis	5	D-4 (2), D-5 (3)
303-30072-00	Battery Catch	20	–
308-01057-02	Housing Accessory Dummy Cover	20	–
311-01049-00	Channel Selector Knob	20	D-2 (1)
311-03108-00	PTT/Function Keypad	20	–
316-06765-00	Rear Panel	5	D-10 (7)
316-06763-00	Knob Label	5	D-2 (3)
365-01673-00	Insert Front Panel Logo Label	1	–
319-01026-00	Main RF Shield	5	D-4 (1)
345-00020-09	PA Screw M2x5mm Pan Torx	10	D-8 (10)
345-00020-11	Chassis Screw M2x8mm Pan Torx	10	D-1 (3)
349-00030-00	Speaker Screw 1.8x5mm Torx	10	D-7 (3)
352-00010-52	Channel/volume Control Nut (M6x7.9x3mm)	20	D-12 (9)
352-01053-00	Antenna SMA Connector Nut	10	D-12 (8)
353-00010-42	Ribbed Lock Washer M6x10x0.7mm	30	D-12 (7)
356-01077-00	Battery Contact Probe	10	D-9 (7)
360-01060-00	PTT/Function Key Actuator	40	–
360-00010-39	Chassis Plug Seal	10	D-10 (9)
362-01087-00	Battery Contact Seal	10	D-9 (8)
362-01106-00	Rear Panel Seal	10	D-10 (5)
362–01089-01	Aux Flex Seal	10	D-10 (2)
362-01091-01	Knob Seal	10	D-12 (10)
362-01092-02	Main Seal	20	–
369-01039-00	Adhesive Ring 40mm (speaker)	5	D-7 (2)
OPP401	Front Panel Assembly. This comprises the following parts:	1	–
	252-00010-77 Speaker 40mm 0.5W 16E FST	1	–
	307-01022-00 Speaker cloth	1	–
	316-06760-00 Front Panel	1	–
	316-06763-00 Knob Label	1	D-2 (3)
	354-01044-00 Bush M2 Threaded Brass	2	–
	369-01039-00 Adhesive Ring 40mm (speaker)	1	D-7 (2)

Table D-3: Orca 5035 spares kit (TOPA-SP-402)

IPN	Description	Quantity	Reference
040-05500-08	Volume Control Switch	10	D-8 (3), D-9 (3)
219-50029-00	RF out assembly	5	D-11 (1)
220-01414-03	Aux Flex Connector PCB	5	D-10 (1)
231-00010-45	Channel Selector Switch	10	D-8 (2), D-9 (2)
232-00010-42	Switch PTT (Low Profile)	5	D-8 (8), D-9 (6)
240-02156-01	Antenna SMA Connector	10	D-12 (4)
252-00010-77	Speaker 40mm 0.5W 16E FST	5	–
252-00010-56	Microphone	5	D-8 (11)
304-07043-00	LCD Holder	1	–
360-02019-00	Microphone Grommet/Seal	10	D-5 (1)
303-11213-00	Handportable Chassis	5	D-4 (2), D-5 (3)
303-30072-00	Battery Catch	20	–
308-01057-02	Housing Accessory Dummy Cover	20	–
311-01049-00	Channel Selector Knob	20	D-2 (1)
311-01050-00	Volume Knob	20	D-2 (2)
311-03108-00	PTT/Function Keypad	20	–
316-06765-00	Rear Panel	5	D-10 (7)
316-06763-00	Knob Label	5	D-2 (3)
316-85133-00	PTT/Function Key Retaining Plate	10	–
319-01203-00	Main RF Shield	5	D-4 (1)
345-00020-09	PA Screw M2x5mm Pan Torx	10	D-8 (10)
345-00020-11	Chassis Screw M2x8mm Pan Torx	10	D-1 (3)
349-00030-00	Speaker Screw 1.8x5mm Torx	10	D-7 (3)
352-00010-52	Channel/volume Control Nut (M6x7.9x3mm)	20	D-12 (9)
352-01053-00	Antenna SMA Connector Nut	10	D-12 (8)
353-00010-42	Ribbed Lock Washer M6x10x0.7mm	30	D-12 (7)
356-01077-00	Battery Contact Probe	10	D-9 (7)
360-01060-00	PTT/Function Key Actuator	40	–
360-00010-39	Chassis Plug Seal	10	D-10 (9)
362-01087-00	Battery Contact Seal	10	D-9 (8)
362-01106-00	Rear Panel Seal	10	D-10 (5)
362–01089-01	Aux Flex Seal	10	D-10 (2)
362-01091-01	Knob Seal	10	D-12 (10)
362-01092-02	Main Seal	20	–
369-01039-00	Adhesive Ring 40mm (speaker)	5	D-7 (2)
OPP501	Front Panel Assembly. This comprises the following parts:	1	–
	252-00010-77 Speaker 40mm 0.5W 16E FST	1	–
	307-01022-00 Speaker cloth	1	–
	316-06761-00 Front Panel	1	–
	316-06763-00 Knob Label	1	D-2 (3)
	354-01044-00 Bush M2 Threaded Brass	2	–
	369-01039-00 Adhesive Ring 40mm (speaker)	1	D-7 (2)
	312-10183-00 Lens	1	D-6 (1)
008-36671-80	LCD Display	1	–
220-01501-00	User Interface Loom PCB	5	–
311-03110-00	Keypad	5	–
311-04006-00	Polyester Dome	5	–
312-01083-00	Lens	2	D-6 (1)
OPF200-B	UI PCB SMT Subassembly	1	–
365-00011-38	Yellow static warning label	3	–
399-00010-86	Static Shielding Bag 127x203mm	3	–

Table D-4: Orca 5020/5040 spares kit (TOPA-SP-403)

IPN	Description	Quantity	Reference
040-05500-08	Volume Control Switch	10	D-8 (3), D-9 (3)
219-50029-00	RF out assembly	5	D-11 (1)
220-01414-03	Aux Flex Connector PCB	5	D-10 (1)
231-00010-45	Channel Selector Switch	10	D-8 (2), D-9 (2)
232-00010-42	Switch PTT (Low Profile)	5	D-8 (8), D-9 (6)
240-02156-01	Antenna SMA Connector	10	D-12 (4)
252-00010-77	Speaker 40mm 0.5W 16E FST	5	–
252-00010-56	Microphone	5	D-8 (11)
304-07043-00	LCD Holder	1	–
316-85133-00	PTT/Function Retaining Plate	10	–
360-02019-00	Microphone Grommet/Seal	10	D-5 (1)
303-11213-00	Handportable Chassis	5	D-4 (2), D-5 (3)
303-30072-00	Battery Catch	20	–
308-01057-02	Housing Accessory Dummy Cover	20	–
311-01049-00	Channel Selector Knob	20	D-2 (1)
311-01050-00	Volume Knob	20	D-2 (2)
311-03108-00	PTT/Function Keypad	20	–
316-06765-00	Rear Panel	5	D-10 (7)
316-06763-00	Knob Label	5	D-2 (3)
319-01203-01	Main RF Shield	5	D-4 (1)
345-00020-09	PA Screw M2x5mm Pan Torx	10	D-8 (10)
345-00020-11	Chassis Screw M2x8mm Pan Torx	10	D-1 (3)
349-00030-00	Speaker Screw 1.8x5mm Torx	10	D-7 (3)
352-00010-52	Channel/volume Control Nut (M6x7.9x3mm)	20	D-12 (9)
352-01053-00	Antenna SMA Connector Nut	10	D-12 (8)
353-00010-42	Ribbed Lock Washer M6x10x0.7mm	30	D-12 (7)
356-01077-00	Battery Contact Probe	10	D-9 (7)
360-01060-00	PTT/Function Key Actuator	40	–
360-00010-39	Chassis Plug Seal	10	D-10 (9)
362-01087-00	Battery Contact Seal	10	D-9 (8)
362-01106-00	Rear Panel Seal	10	D-10 (5)
362–01089-01	Aux Flex Seal	10	D-10 (2)
362-01091-01	Knob Seal	10	D-12 (10)
362-01092-02	Main Seal	20	–
369-01039-00	Adhesive Ring 40mm (speaker)	5	D-7 (2)
OPP601	Front Panel Assembly. This comprises the following parts:	1	–
	252-00010-77 Speaker 40mm 0.5W 16E FST	1	–
	307-01022-00 Speaker cloth	1	–
	316-06762-00 Front Panel	1	–
	316-06763-00 Knob Label	1	D-2 (3)
	354-01044-00 Bush M2 Threaded Brass	2	–
	369-01039-00 Adhesive Ring 40mm (speaker)	1	D-7 (2)
	312-10183-00 Lens	1	D-6 (1)
008-36671-80	LCD Display	1	–
220-01501-00	User Interface Loom PCB	5	–
311-03109-00	Keypad	5	–
311-04005-00	Polyester Dome	5	–
312-01083-00	Lens	2	D-6 (1)
OPF200-B	UI PCB SMT Subassembly	1	–
365-00011-38	Yellow static warning label	3	–
399-00010-86	Static Shielding Bag 127x203mm	3	–

Table D-5: Orca 5010/5030 Re-skinning kit (TOPA-SP-404)

IPN	Description	Quantity
311-01049-00	Channel Knob Gr	1
311-01050-00	Volume Knob Gr	1
311-03108-00	PTT/Function Keypad	1
316-06765-00	Rear Panel	1
316-85133-00	PTT/Function keypad retainer plate	1
345-00020-11	Screw M2x8mm SS Pan Torx Patch	2
360-01060-00	Actuator Pressel	2
362-01106-00	Rear Cover Seal	1
362-01091-01	Knob Seal	1
362-01092-02	Main Seal	1
OPP401	PHA Front Panel Assembly	1

Table D-6: Orca 5035 Re-skinning kit (TOPA-SP-405)

IPN	Description	Quantity
311-01049-00	Channel Knob Gr	1
311-01050-00	Volume Knob Gr	1
311-03108-00	PTT/Function Keypad	1
316-06765-00	Rear Panel	1
316-85133-00	PTT/Function keypad retainer plate	1
345-00020-11	Screw M2x8mm SS Pan Torx Patch	2
360-01060-00	Actuator Pressel	2
362-01106-00	Rear Cover Seal	1
362-01091-01	Knob Seal	1
362-01092-02	Main Seal	1
OPP501	PHA Front Panel Assembly	1

Table D-7: Orca 5020/5040 Re-skinning kit (TOPA-SP-406)

IPN	Description	Quantity
311-01049-00	Channel Knob Gr	1
311-01050-00	Volume Knob Gr	1
311-03108-00	PTT/Function Keypad	1
316-06765-00	Rear Panel	1
316-85133-00	PTT/Function keypad retainer plate	1
345-00020-11	Screw M2x8mm SS Pan Torx Patch	2
360-01060-00	Actuator Pressel	2
362-01106-00	Rear Cover Seal	1
362-01091-01	Knob Seal	1
362-01092-02	Main Seal	1
OPP601	PHA Front Panel Assembly	1

Table D-8: Orca 5020/5035/5040 User Interface PCB and Shield (TOPA-SP-407)

IPN	Description	Quantity
OPF200-B	UI PCB SMT Subassembly	1
311-04005-00	Ins Poly Dome for 5020/5040	1
319-01026-00	Main Shield RF	1
399-00010-86	Static Shielding Bag 127x203mm	1
008-36671-80	LCD Display 12x2 Lines Flex	1
304-07043-00	LCD Frame Holder	1
220-01501-00	PCB Flexi User Interface	1

PART E

Battery packs and chargers

This part provides information on the battery packs and chargers available for Tait Orca 5000 handportables.

The battery packs are not serviceable, and repair of chargers is limited to replacement of the spring contacts, the discharge tact switch and the DC jack.

Contents

04/01 IPN: 449-51000-03

Battery packs

Four battery packs are available for Tait Orca 5000 handportables. These battery packs are not serviceable, but their construction and expected life are described below.

The battery packs available are:

- 1100 mAh NiCd battery pack;
- 1500 mAh NiCd battery pack;
- 1500 mAh NiMH battery pack; and
- 2000 mAh NiMH battery pack.

The battery casing is made of a rugged resin material and is ultrasonically welded. The casing is constructed with a planar, near field interference weld (<3 mm).

Battery shift life

Battery shift life is outlined in Table E-1. These are typical figures only, based on a conventional UHF radio with medium economy cycling enabled. Battery shift life for other models can be calculated from the information in *Part B: Radio specifications and circuit descriptions*.

Preserving battery shift life

Before first use, the battery must be fully charged. It is highly recommended that the battery be put through a condition/analyse cycle before first use.

Other steps that can preserve battery shift life are as follows.

- Condition the battery weekly using the Tait Orca fast charger.
- Avoid storing the battery for extended periods without first fully recharging it. For best results, store the battery detached from the radio.
- Avoid repeatedly recharging the battery when it has only had a small amount of use.
- Turn the radio off when it is unattended for long periods.
- Use only a Tait-recommended charger.
- Maintain an ambient temperature of between 5°C and 40°C during recharging. Optimum battery performance will be obtained between 15°C and 25°C.
- Do not allow the battery pack contacts to become short-circuited.

Table E-1: Typical battery shift life for a conventional UHF radio* with medium economy cycling enabled, no signalling/scanning at 25°C

Duty cycle	RF power	Battery shift life (hours)			
		1100 mAh NiCd	1500 mAh NiCd	1500 mAh NiMH†	2000 mAh NiMH†
5/5/90	Low (1 W)	11.5	16	16	21
5/5/90	High (4 W)	8.5	11.5	11.5	15
10/10/80	Low (1 W)	7.5	10.5	10.5	14
10/10/80	High (4 W)	5	7	7	9

* Battery shift life for other models can be calculated from the information in Part B: Radio specifications and circuit descriptions.

† NiMH batteries are best suited for monitoring, low power applications where transmissions are infrequent.

Extending battery shift life

Battery shift life can be extended by activating economy mode (conventional radios) or by using dynamic power control (trunked radios).

During economy mode, the radio cycles between the normal receive state and a standby state in which some of the radio's circuitry is switched off or placed on standby mode. Dynamic power control optomises the radio's power use by reducing the transmit power in high signal strength areas.

Typical drain rates for a conventional UHF radio are:

- 80 mA on standby (no audio);
- 55 mA with low economy cycling enabled;
- 45 mA with medium economy cycling enabled; and
- 40 mA with high economy cycling enabled.

Economy cycling in conventional radios is programmed in the **Power Save Features** screen of the *Tait Orca Portable Conventional Programming Application (TOPCPA)*. Dynamic power control in trunked radios is enabled in the **User Selectable Parameters** screen of the *Tait Orca Portable Trunked Programming Application (TOPTPA)*.

Disposing of used nickel-cadmium batteries

NiCd batteries contain a small amount of the metal cadmium, which can produce potentially toxic waste if not disposed of properly. When no longer in use, contact your Tait dealer for recycling details.

Battery chargers

Important Note: In order to charge the new 1500 NiMH (TOPB700) battery, the charger must have firmware version 2.07 or later installed. The 2000 mAh battery can be charged on chargers with firmware version 2.05 or later installed.

Three battery chargers are available for Tait Orca handportables:

- desktop fast charger;
- desktop trickle charger; and
- six-way multi-charger.

The fast charger charges, conditions and analyses the battery. The trickle charger only charges the battery, and does not have a discharge button but is otherwise identical in appearance to the fast charger. The multi-charger is made up of six fast chargers, and charging instructions for the fast charger also apply to the multi-charger.

Note that the trickle charger should not be used for NiMH battery packs as they can take up to 24 hours to charge fully and the overall lifetime of the battery may be reduced. NiMH battery packs should be charged using a fast charger.

Repair of chargers is limited to replacement of the spring contacts, the discharge tact switch and the DC jack.

The repair information provided for the fast charger also applies to repair of the trickle charger and multi-charger.

A spares kit is available for Tait Orca chargers (TOPA-SP-202). The contents of the spares kit is shown in Table E-2, and the assembly of these parts is shown in Figure E-3.

Table E-2: Contents of the Tait Orca chargers spares kit (TOPA-SP-202)

IPN	Description	Quantity	For charger
240-02020-07	Skt DC jack	10	All
232-00010-28	Tact switch	10	Desktop fast charger Multi-charger
302-40054-01	Charge/discharge button	10	Desktop fast charger Multi-charger
262-00001-00	Charger light pipe	10	Desktop fast charger Multi-charger
312-01069-02	Charger top	10	All
312-01070-01	Charger base	10	All
365-01549-01	Charger logo label	10	All
365-01598-01 365-01601-00	Charger labels	10	Desktop fast charger Multi-charger
365-01597-00 365-01601-02	Charger labels	5	Desktop trickle charger
369-00010-11	Rubber charger foot	40	All
360-01059-00	Trickle charger blanking label	10	Desktop trickle charger
356-01079-00	Spring probe charger bias-ball	40	All

Desktop fast charger

The Tait Orca desktop fast charger (Figure E-1) is an intelligent charger that can charge, condition and analyse both NiCd and NiMH batteries of varying capacities up to 2 Ah.

Fast charger operation

A circuit diagram of the fast charger is shown in Figure E-2. The fast charger operates using constant current charging and multiple criteria for end-of-charge detection. When a battery is inserted, the charger detects the type of battery, checks to see if it is working correctly, and then charges the battery.

If the discharge button is pressed after inserting the battery, the charger will discharge the battery before charging. If the discharge button is held down while the battery is being inserted, the charger will enter a condition/ analyse cycle that will discharge and charge the battery a number of times and, on the last cycle, check its capacity.

Multiple protection methods are employed to ensure safe operation.

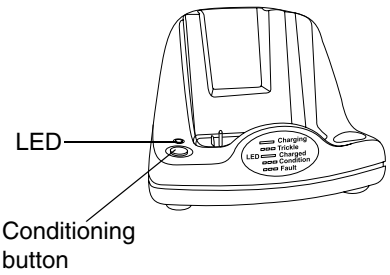


Figure E-1: Tait Orca fast charger

Hardware operation

Power to the unit is provided from a 12 volt, 1 amp (nominal) wall-mounted AC to DC adaptor, through SK1. Reverse polarity protection is provided by the 22 V transient suppressor, D1, in conjunction with poly-switch PS1. Under reverse polarity conditions, D1 conducts, drawing the available short circuit current until PS1 trips. D1 also protects against any voltage spikes that may come through the AC to DC adaptor. The maximum safe input voltage range is 10.5 V to 17 V; however, the unit is designed for 10.5 - 14 V operation.

The +5V supply is produced by the regulator, IC1. A feature of this regulator is that it provides a RESET output to the microprocessor. This RESET output is used to delay startup of the microprocessor until the power supply has stabilised after turn-on. It also puts the microprocessor into reset if the input voltage falls too low. D2 sets this low voltage threshold to approximately 9.2 V.

The intelligence of the fast charger is provided by the microprocessor, IC2, which interfaces with the current source, the discharge circuit and the expanded battery voltage interface. The user can interact with the fast charger by pressing the discharge button, SW1, and can observe the operational state on the tri-colour LED, D5.

The current source is based on a ground-sensing linear topology. R1 and R2 are the current sense resistors. The power device is a P-channel MOSFET, Q4, which is controlled by an operational amplifier, IC3:A. The feedback path that controls the op amp, and hence the current, is through transistor Q5 and its resistor network. The grounding on R23 includes the ground sense resistors in the feedback path. The nominal output current is 800 mA.

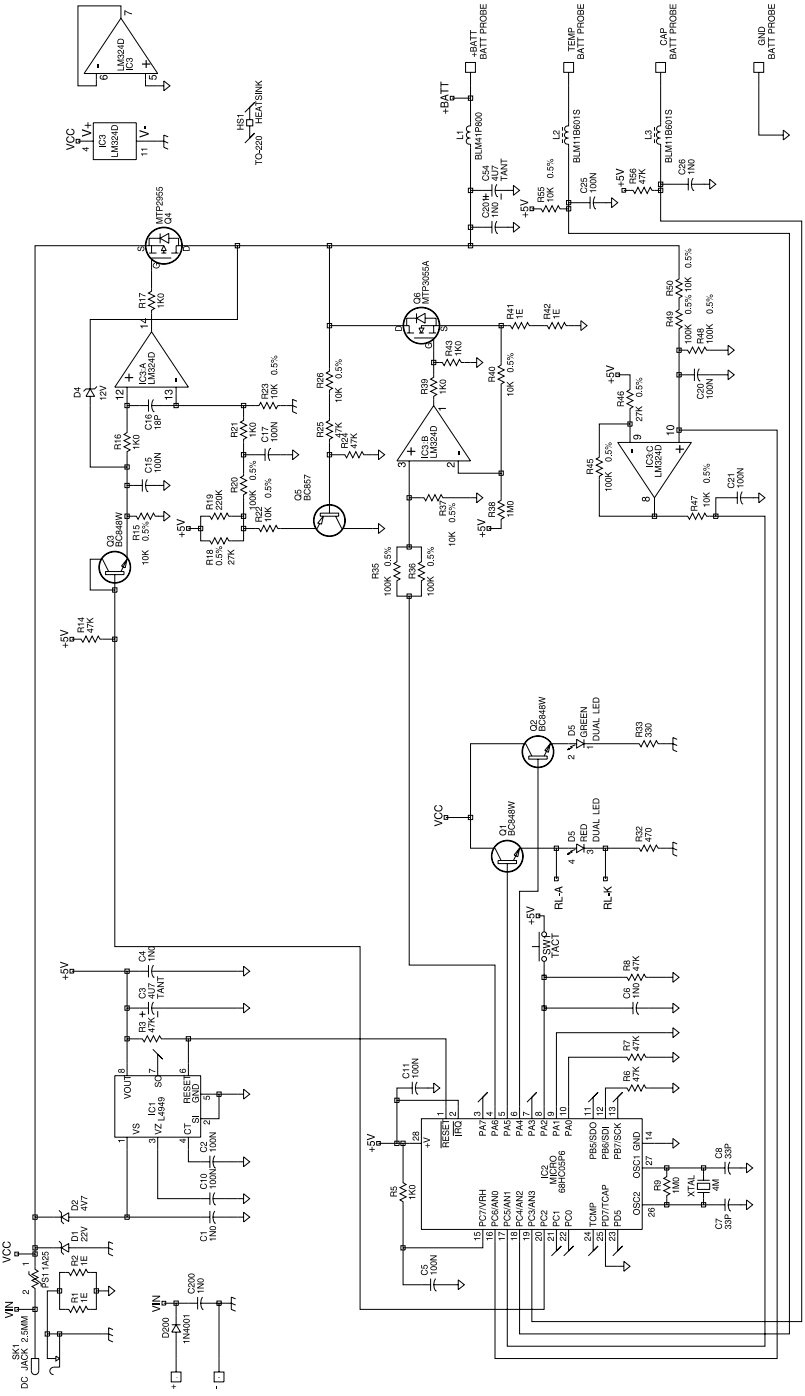


Figure E-2: Circuit diagram of the Tait Orca desktop fast charger

The discharge circuit is based around a constant current sink. This uses an N-channel MOSFET, Q6, controlled by an operational amplifier, IC3:B. R41 and R42 are the current sense resistors that allow the op amp to set the current. The nominal discharge current is 400 mA.

The microprocessor needs to be able to monitor the battery voltage. A coarse voltage is provided by the voltage divider R48, R49 and R50. This voltage divider brings the range of battery voltage into the same range as the microprocessor A/D input (0-5 V). This enables the microprocessor to monitor the general battery voltage. An expanded battery voltage interface is based around operational amplifier IC3:C. It expands a small window of battery voltage over the range of the microprocessor A/D input. This enables the microprocessor to detect small changes in battery voltage and accurately pick when the battery voltage drops below peak.

The interface to the battery is through four contacts, positive (+BATT), temperature (TEMP), capacity (CAP) and ground (GND). The positive and ground contacts are the main connections for charging. In the battery pack, the temperature contact is connected to ground via a thermistor. This allows the charger to monitor the temperature of the battery and if the battery temperature is outside the range +5°C to +40°C, the charger will not charge the battery. The chargers also uses the temperature line for detecting the presence of a battery; for example, detecting whether the battery has been inserted or removed from the charger. In the battery pack, the capacity contact is connected to ground via a resistor. If there is a capacitor in parallel with the capacity resistor, then the resulting time constant indicates to the charger that the battery pack is NiMH. Consequently, battery packs that do not have a capacitor in parallel with the capacity resistor are considered to be NiCd.

Software operation

The charging sequence is as follows.

- battery flat check;
- battery type detection;
- battery open circuit test;
- battery dead short circuit test;
- battery short circuit test;
- battery temperature test;
- battery discharge (optional);
- fast charge;
- trickle charge;
- standby charge.

When the presence of a battery has been detected, the charger conducts a battery flat check to determine the flatness of the battery.

Battery type detection is used to determine if the battery pack is NiCd or NiMH. The charger then executes the battery fault tests to check for defects in the battery. Failure of any test results in a battery fault indication and terminates the charge sequence.

The battery open circuit test applies charge current for 1 second and checks to see if the battery pack is open circuit (the battery voltage is below an upper limit).

The battery dead short circuit test applies charge current for 3 seconds to check that the battery is not a direct short between its positive terminal and ground.

The battery short circuit test applies charge current for 19 seconds and checks to see if the battery voltage is sufficiently high to start charging.

The battery temperature test checks to see whether the internal battery temperature is within the required limits of +5 °C to +40 °C.

Once the battery fault tests have been successfully passed, the charger can enter either the fast charge or discharge. If the user has pressed the discharge button, then the charger will

enter a discharge cycle; otherwise, it will enter the fast charge cycle. The discharge cycle drains the battery to a lower limit, then the fast charge cycle is initiated. By discharging the battery prior to charging, the health of the battery can be maintained at its optimum level.

During the fast charge cycle, the battery is charged with a constant current until one of the end-of-charge (EOC) conditions is met. This requires the monitoring of battery temperature and voltage, and charge time.

If the end of the fast charge timeout period is reached and the battery voltage is not above a minimum threshold, then fast charge is terminated and a faulty battery indication is given.

During fast charge, the expanded battery voltage interface is monitored for transients. If a transient is detected, then all EOC conditions, except timeout, are disabled for 60 seconds.

When an EOC condition is successfully met, the charger enters trickle charge, which pulses the charge current to give a low average current. NiCd batteries are trickle charged with a current of 115 mA for 90 minutes, and NiMH batteries are trickle charged with a current of 115 mA for 90 minutes. After trickle charge, the charger enters standby charge, which pulses the charge current at a reduced rate until the battery is removed. If the total charge time was less than 10 minutes, the charger skips trickle charge and goes straight into standby charge. If during trickle or standby charge the battery voltage falls to the discharged battery threshold, the charger restarts the charge cycle as if the battery has just been inserted.

An analyse/condition mode is available to check the health of a battery. If the user inserts a battery while holding down the discharge button, the charger will enter the analyse/condition mode. In this mode, the battery will be discharged and charged a number of times. NiCd batteries go through three discharge/charge cycles, while NiMH batteries go through two discharge/charge cycles. The last discharge stage is timed and if the discharge time is less then 120 minutes for NiCd batteries or 180 minutes for NiMH batteries, a capacity fault will be indicated, and the battery will remain discharged. If the capacity is satisfactory, the battery will charge as normal.

Using the fast charger

Fast charger indicators are described in Table E-3.

Table E-3: Fast charger indicators

Indicator	Meaning
steady red	battery charging
steady green	battery charged
steady amber	charge suspended until battery temperature is within correct range
flashing red	battery not seated properly in the charger, contacts dirty or battery faulty
flashing green	battery trickle charging
flashing amber	battery being long or short conditioned

Charging the battery using the fast charger

Charging using the fast charger involves three stages.

- The fast charge stage quickly brings the battery up to near its full capacity. The charger LED will glow red.
- The trickle stage slowly tops up the battery until it is at its full capacity, which is typically 1 1/2 hours. The charger LED will flash green.
- The standby charge stage keeps the battery at its full capacity, as long as the radio is turned off. The charger LED will glow green.

The battery can be charged separately or attached to the radio. The radio must be turned off to ensure a full charge.

Turn off the radio and insert the battery/radio into the charger. The charger LED will glow amber for three seconds, then red. If the indicator does not glow red, make sure the battery/radio is seated properly and the charger is plugged in correctly. If the battery is too hot or too cold, the indicator will remain amber until the battery temperature is within the safe range for recharging (5°C to 40°C).

Approximate charge times are:

- up to 1½ hours for the 1100 mAh NiCd battery (TOPB100/TOPB600);
- up to 2 hours for the 1500 mAh NiCd battery (TOPB200);
- up to 2 hours for the 1500 mAh NiMH battery (TOPB700); and
- up to 2 ½ hours for the 2000mAh NiMH battery (TOPB500).

Once the battery has reached approximately 80% capacity, the indicator will flash green. At this point, it is recommended the battery be left in the charger for a further 1 to 2 hours, to ensure maximum battery charge. Once the battery is fully charged, the indicator will glow green. Leaving the battery in the charger once it is fully charged does not damage the battery.

Conditioning the battery with the fast charger

Two conditioning functions are available on the fast charger, a short conditioning cycle and a long conditioning cycle. The short cycle discharges the battery then charges it. Regularly recharging a battery that has not been completely discharged will eventually affect its ability to hold a full charge.

For best performance, the battery should be conditioned weekly using the fast charger. Conditioning the battery takes about four to eight hours, depending on how much use it has had.

Note: Do not use the short conditioning cycle on a new battery without first fully charging it.

The long conditioning cycle may be necessary when:

- the battery performance has deteriorated; or
- if a battery has been stored for a long time.

To short condition the battery

Turn off the radio and insert the battery/radio into the fast charger. When the charger LED glows red, press the conditioning button until the indicator flashes amber. Release the conditioning button. The LED will flash amber while the battery is being discharged. Once the battery is discharged, it will charge normally. The battery is ready to be used again when the charger LED glows green.

To long condition the battery

Turn off the radio and insert the battery/radio into the fast charger. Press and hold the conditioning button until the charger LED flashes amber. Release the conditioning button. The battery is ready to be used again when the charger LED glows green.

Conditioning/analysing the battery with the fast charger

Conditioning/analysing the battery with the fast charger will put the battery through a number of conditioning cycles and will check the battery's capacity on the last cycle.

To condition/analyse the battery, turn off the radio. Press and hold the discharge button while inserting the battery/radio. Continue holding the discharge button; the indicator will glow amber for three seconds, and then will flash amber. When the indicator flashes amber, release the discharge button.

The condition/analyse cycle will take approximately 16 hours.

Once charged, the charger's indicator will glow green if the battery is in good condition. The indicator will flash red if the battery is below its optimum capacity; consult your Tait dealer.

Repairing the fast charger

The assembly of the fast charger is shown in Figure E-3.

Depress the release tab in the base of the charger using the end of a flat-bladed screwdriver. Holding the lever in, gently pull the body away from the base. Lift out the PCB.

Replace the battery contacts, the tact switch and the DC jack, if necessary.

Replacing the spring contacts

Note that in some earlier chargers, the two outer contacts are the same type as the two inner contacts. If this is the case, the two outer holes must be drilled out to 2.2 mm to accommodate the larger new positive and negative spring contacts. Figure E-4 shows the charger PCB with the location of the different spring contacts indicated.

Remove the faulty contacts with a soldering iron and discard. When placing the replacement contact, it must not be bent or otherwise damaged. Solder the replacement contact in place using a heavy-tip soldering iron (e.g. Weller 2PTCC8 tip). Hold onto the contact with a pair of pliers and apply solder to the PCB, rather than to the contact, to avoid contact damage.

Replacing the discharge tact switch

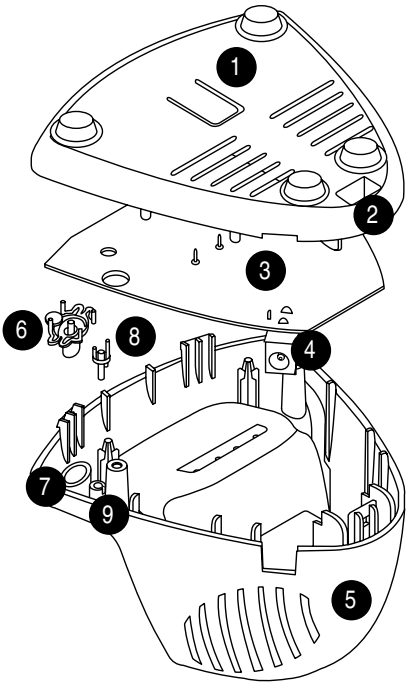
Remove the tact switch using a desoldering station or solderwick. Place the new part on the board and solder it in place using a medium-tip soldering iron (e.g. Weller PTA7 tip).

Replacing the DC jack

Remove the DC jack using a desoldering station or solderwick. There is a lot of solder on both sides of the board, so be sure to remove it all.

Place the new part on the board and solder it in place using a heavy-tip soldering iron (e.g. Weller 2PTCC8 tip).

Figure E-3: Assembly of the desktop fast charger



1. charger base
2. access to the release tab
3. PCB
4. DC jack
5. charger top
6. discharge button
7. fit discharge button here
8. light pipe
9. fit light pipe here

Reassembling the charger

Refer to Figure E-3.

Hold the body of the charger upside down and insert the discharge button and the light pipe; both parts self-orient. Place the PCB so it rests on the location pins. Attach the base at the front edge, and clip it down at the back.

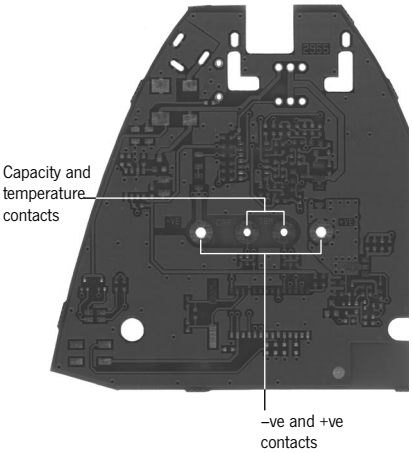


Figure E-4: The fast charger PCB, showing the location of the different spring contacts

Desktop trickle charger

The Tait Orca desktop trickle charger can charge a 1100 mAh or 1500 mAh NiCd battery overnight. It is designed to provide approximately 1450 mAh of charge in a 16 hour period. Thus both 1100 mAh or 1500 mAh NiCd batteries can be charged. Simple protection of the radio is provided in the form of an open circuit voltage limit as well as short circuit protection.

Figure E-5 shows the charger current profile. Figure E-6 shows the circuit diagram for the trickle charger.

Trickle charger operation

When the battery voltage is above approximately 8 V, the charge current is inversely proportional to the battery voltage. This characteristic is produced by Q100, Q101 and Q102. The charge current is determined by the current through R104, which is set by Q102, its emitter resistors and the reference voltage. The slope of the curve is determined by Q101 and R106. The reference voltage is provided by an 8.2 V Zener diode (D100).

When the battery voltage is below approximately 8 V, the charge current is proportional to the battery voltage. This is accomplished by using Q103 to change the reference voltage in proportion to the battery voltage. This changes the current through R104, which changes the charge current, as desired.

The maximum voltage available from the trickle charger is limited to less than 10.5 V by R111, in conjunction with Q101, so that the radio can not be damaged if the battery goes open circuit. If the battery goes short circuit, then Q102 is held off by Q103 and thus Q100 is off, and there is negligible charge current.

On startup, the state of the charger is similar to that when the charger output is shorted. When power is applied, VIN starts to rise and the emitter voltage of Q103 rises. However, the base of Q103 is still at zero volts, so Q103 starts to turn on. When Q103 is on, it will maintain Q102 off and hence Q100 will also stay off. Thus when VIN has risen to its final value, the circuit is in an off state, giving negligible output voltage and charge current.

In order to activate the circuit, a minimum voltage of approximately 2.6 V (a battery) must be connected to the circuit to charge C101 and turn Q103 off, thus turning on the charger.

The LED is on whenever there is sufficient charge current. Its brightness is proportional to the charge current profile, and its turn-on and turn-off thresholds are determined by R105. Thus the LED is on under normal charging, dims when the battery approaches full charge and is off under fault/no charge conditions.

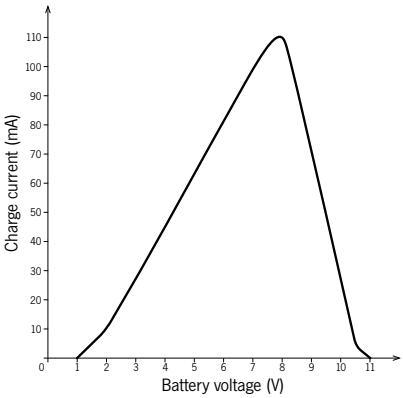
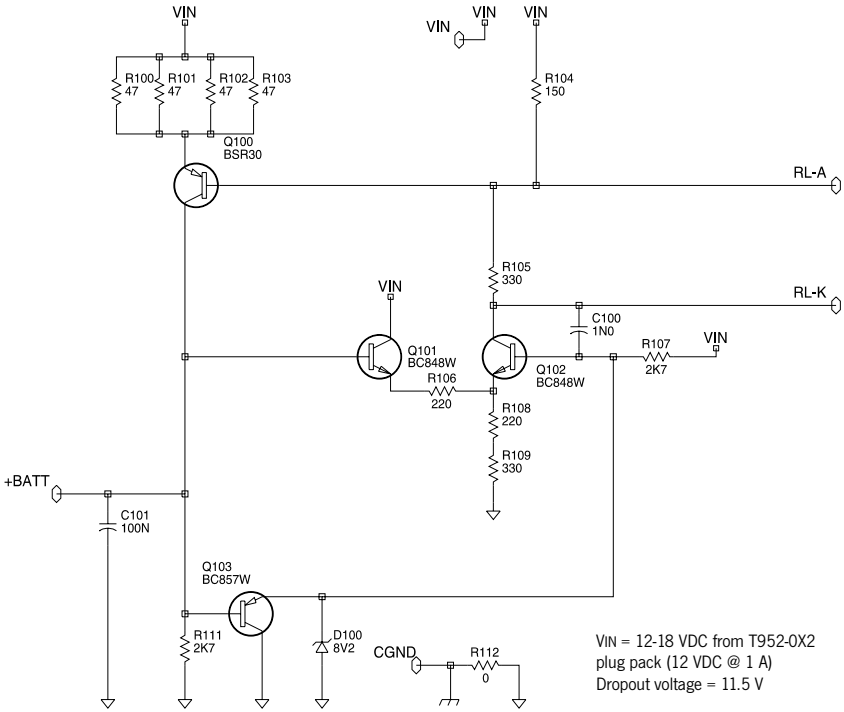


Figure E-5: Tait Orca desktop trickle charger current charge profile

Figure E-6: Circuit diagram of the Tait Orca desktop trickle charger



Using the trickle charger

The trickle charger is not recommended for NiMH battery packs, as they can take up to 24 hours to charge fully and the overall lifetime of your battery may be reduced. Use a fast charger instead.

The battery can be recharged attached to the radio or as a separate unit. To charge the battery pack using the trickle charger, make sure the radio is turned off. Insert the battery/radio into the charger. Make sure the indicator on the charger glows red. If the indicator does not glow red, check that the battery/radio is seated properly and the charger is plugged in correctly. The indicator will remain red until the radio is removed from the charger.

The battery will be fully charged in about 16 hours. You can leave the battery in the charger until you next need to use the radio. However, leaving the battery in the charger for longer than 24 hours is not recommended.

Repairing the trickle charger

For instructions on repairing the trickle charger, refer to those for repairing the desktop fast charger.

Troubleshooting

When inserting the battery/radio in the charger, the charger LED is not as expected.

- Make sure the battery/radio is seated properly in the charger.
- Check that the charger is properly plugged in.
- Check that the battery and charger contacts are clean.

The charger LED glows amber.

- Safe range for charging is 5°C to 40°C, and optimum battery performance will be obtained between 15°C and 25°C. The battery will start charging when the battery termperature is within the range 5°C to 40°C.

Basic Maintenance

Your Tait Orca handportable requires no regular maintenance other than ensuring that the battery has sufficient charge and that no damage has occurred to the antenna or the battery pack.

General Care

- Wipe the battery contacts, accessory connector contacts and radio display with a dry lint-free cloth to remove any dirt, oil or grease.
- Use a cloth dampened with clean water to clean the radio's case and display lens, but do not immerse the radio in fluids.
- Do not allow the radio to come into contact with detergents, alcohol, aerosol sprays or petroleum-based products as they may permanently damage the case.
- Avoid high temperatures. If the radio overheats, it will cease to function. You will hear two short high-pitched beeps.

Troubleshooting

If you are experiencing difficulty operating your Tait Orca handportable check the following items:

- Is the battery firmly attached to the radio?
- Is the battery sufficiently charged?
- Is the battery charger working properly?
- Is the antenna damaged?

If all appears to be in order but your radio still fails to operate properly, consult your local Tait dealer for assistance.

Multi-charger

The multi-charger (TOPA-CH-300) is made up of six desktop fast chargers that operate independently of one another. Each multi-charger PCB has an additional diode.

Multi-charger operation

The operation of the multi-charger is the same as that of the desktop fast charger.

Figure E-7: The Tait Orca six-way multi-charger

Repairing the multi-charger

Should one of the charger units be faulty, you can repair it according to the instructions for the desktop fast charger, or replace the faulty PCB with a fast charger PCB to which the diode (1N4001 or similar) has been added (refer to Figure E-8)..

To remove a faulty charger from the multi-charger:

- Unplug the power cord.
- Undo the 10 screws at the base of the radio using a Pozi 1 driver.
- **Do not** pull the top off the charger using the housing of the individual chargers. Instead, from the side of the charger, lift the top cover up and gently fold back.
- Unplug the red and black wires leading to the faulty charger.
- Remove the three screws holding the faulty charger to the top of the multi-charger.
- Gently pull the faulty charger away from the multi-charger top. Turn the charger upside down so that the release tab is at the top.
- Depress the release tab using the end of a flat-bladed screwdriver and gently pull the base away from the body.
- Desolder both wires.
- Repair the board or replace it with a new one to which the required diode has been added.
- Pass the wire through the charger base and solder them to the PCB.
- Solder the red wire to the positive terminal on the PCB and the black wire to the negative terminal on the PCB.
- Place the charger upside down and make sure the discharge button, the light pipe and the PCB are seated properly.
- Attach the base at the front edge, and clip it down at the back.

- Gently pull the wires through the multi-charger top while aligning the charger with the three screw holes.
- Fasten the charger to the multi-charger top using the three screws.
- Reconnect the red and black wire to the fuse connector. Ensure that the polarity is correct.
- Close up the multi-charger, replacing the 10 screws using a Pozi 1 driver.

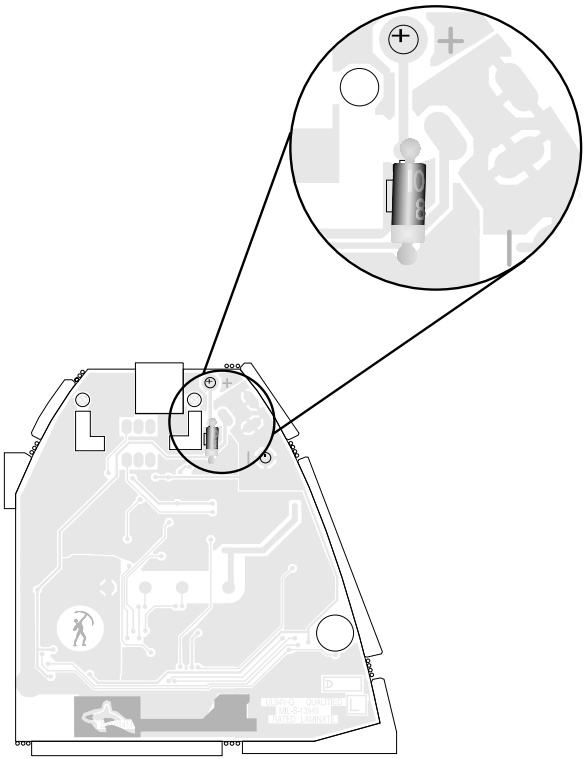


Figure E-8: The Tait Orca Fast Charger PCB. The inset shows where to place the diode (1N4001 or similar) for using the PCB in a multi-charger

Fuse replacement

Each charger is protected by a 3A fuse. To replace a fuse, open the multi-charger as described previously. The fuse must be replaced with a 12V 3A secondary fuse made from material with a Class V-2 flammability rating.

A suitable fuse can be ordered directly from Customer Services, Tait Electronics (IPN 265-00010-64).

PART F

Accessories

This part describes how to interface accessories with Tait Orca 5000 handportables, using the Tait Orca accessory connector and the 7.5 mm accessory adaptor (both with and without the D-clip).

Detailed servicing information about the Tait Orca vehicle kit is also provided on page F-10.

A list of audio accessories currently available for use with Tait Orca 5000 handportables is found in Table A-1, on page A-8.

Contents

Tait Orca 5000 Accessory Connector

The Tait Orca 5000 handportable has a versatile accessory interface on the rear of the radio for connecting external accessories, such as speaker microphones and headsets.

There are four Tait accessory connector kits available for Tait Orca 5000 handportables:

- Accessory Connector Kit (TOPA-AA-006);
- RF Accessory Connector Kit (without D-clip) (TOPA-AA-007).
- Accessory Connector Kit with D-clip (TOPA-AA-106); and
- Accessory Connector Kit with D-clip (TOPA-AA-107)

Each kit contains the accessory connector PCB with the required spring probes soldered on. The board supplied with the RF accessory connector kit has four additional probes for RF applications.

Figure F-1 shows the bottom side of the accessory connector PCB and a circuit diagram of the accessory connector is shown in Figure F-3.

Table F-1 shows the signals available at the accessory connector, and the signals are described in more detail in "Accessory Connector Signal Descriptions" on page F-6.

Connecting an Accessory

Check that your accessory is compatible with the accessory connector by referring to Table F-1 "Accessory connector signal specifications" on page F-5. If connecting a headset, refer to "Connecting a Headset" on page F-5 for connection details.

Accessory Connector PCB Link Options

There are two optional links on the accessory connector PCB.

To turn off the radio's internal speaker, short link 1 ('LINK1', shown in Figure F-1).

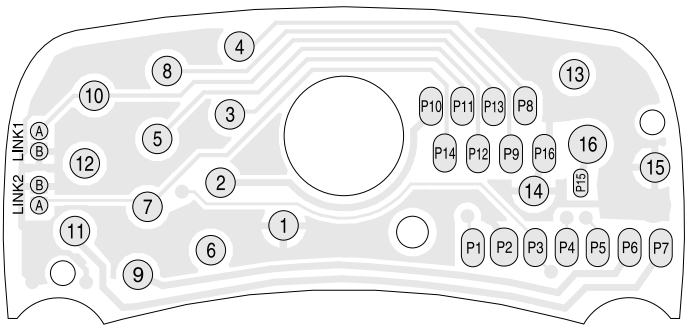
If an external switch is to be used to control the EXT-PTT line, for example in a handsfree vehicle kit, short link 2 ('LINK2', shown in Figure F-1).

Accessory Connector PCB Connections

Solder pads P1 to P16 are provided on the bottom side of the accessory connector PCB for connection to external accessories. The location of these pads is shown in Figure F-1.

This diagram also shows the locations of the spring probes 1 to 16, and links 1 and 2.

Figure F-1: Tait Orca accessory connector PCB - bottom side



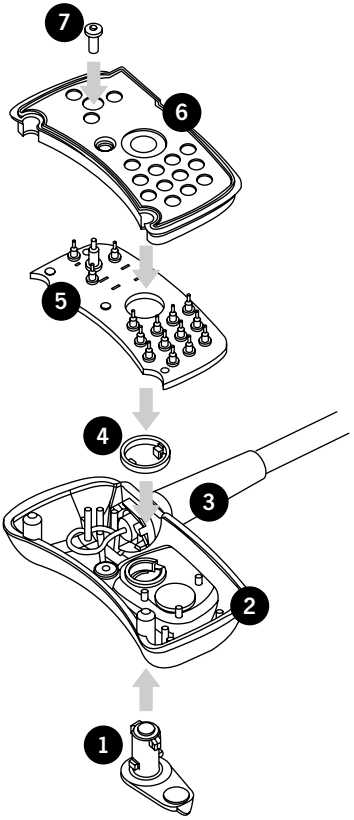
Accessory Connector Assembly

Assemble the accessory connector (for TOPA-AA-006 and TOPA-AA-007) as shown in Figure F-3.

The order of assembly is as follows.

1. Fit the lock to the accessory connector housing.
2. Fit the retainer ring so that it holds the lock firmly to the housing.
3. Thread the cable from your accessory through the accessory housing, making sure it goes through in the proper direction.
4. Slide a grommet of appropriate size onto the cable and pull firmly so the cable and grommet fit in place.
5. Strip and tin the accessory signal wires.
6. Solder the accessory wires to the correct pads on the accessory connector PCB (refer to Table F-2 for headset connections).
7. Fit the accessory connector PCB links, if required.
8. Crimp the cable at an appropriate distance along the cable, approximately in line with the edge of the PCB.
9. Use narrow-nose pliers to pull out the appropriate plugs in the seal and fit it onto the PCB.
10. Fit the grommet and PCB/seal into the housing and secure it with the supplied screw.

Figure F-2: Accessory connector assembly diagram



1. lock
2. accessory connector housing
3. grommet
4. retainer ring
5. accessory PCB, complete with pins
6. PCB seal
7. screw M2*5 Pan Pozi

Table F-1: Accessory connector signal specifications

Signal	Description	Type	Signal level	Output impedance /current	Input impedance
RX-DET-AF-ACC	Unmuted receive audio	Analogue audio 1.15-1.6 VDC	53-225 mV_{rms}	2.2 kΩ	–
MOD-AUDIO	Modulator input	Analogue audio	0-4.8 V_{pp} 2.4 VDC	–	470 Ω
+7V5-ACC*	Accessory power	DC supply	7.0 V* nominal	20 mA (max)	–
RXD-ACC	Serial receive data	CMOS	high = 0 low = 1	–	–
TXD-ACC	Serial transmit data	CMOS	high = 0 low = 1	1 mA (max)	–
SENSE-0-ACC	Accessory sense (internal speaker disable)	CMOS	high = 1 low = 0	1 mA (max)	–
SENSE-1-ACC	Accessory sense (VOX mode)	CMOS	high = 1 low = 0	1 mA (max)	–
EXT-MIC	External microphone input (electret)	Analogue audio	11 mV_{pp} (typical) DC coupled	–	1 kΩ
EXT-PTT	External push-to-talk input	Analogue DC	0-5 V, PTT = 0 V	–	27 kΩ
EXT-SPKR	External speaker differential output	Analogue audio	±6.5 V_{pp} differential	To drive 16 Ω differentially	–
EXT+SPKR	External speaker differential output	Analogue audio	±6.5 V_{pp} differential	To drive 16 Ω differentially	–
RF	Accessory antenna connection	Radio frequency	Tx: 5 W_{rms} (max)	50 Ω	–

* Dependent on battery charge level.

Connecting a Headset

The headset must meet the following basic specifications:

- speaker impedance: 32 Ω (16 Ω min);
- speaker power: 1/4 W_{rms} (min);
- microphone: electret, approximately 1 kΩ; and
- PTT: switch not in line with microphone. Note that if your headset has a PTT in line with the microphone, it can be connected with the 7.5 mm accessory adaptor. See "7.5 mm Accessory Adaptor" on page F-8 for more information.

Determine the compatibility/suitability of your headset by checking Table F-1. If it is compatible, follow the assembly procedure outlined previously, on page F-4.

Solder the headset wires onto the accessory connector PCB pads, as shown in Table F-2.

To turn the radio speaker off and only have the headset speaker on, short link 1 (LK1). This ties SENSE-0-ACC to GND, telling the radio to turn the speaker off.

Note that SPEAKER+ and SPEAKER- must not short to GND, or to any other signal.

Table F-2: Accessory connector headset connections

Solder to these pads	Signal from headset
P1	MIC
P2	GND
P3	PTT
P6	SPEAKER–
P7	SPEAKER+

Accessory Connector Signal Descriptions

RX-DET-AF-ACC

The RX-DET-AF-ACC line carries unprocessed receive audio from the output of the detector IC.

MOD-AUDIO

The MOD-AUDIO line is used during calibration to set up the modulation balance and by some accessories, such as modems.

+7V5-ACC

The +7V5-ACC line supplies +7.5 V to accessories and is limited to 20 mA maximum. The output voltage itself will change depending on the battery voltage level, and there will be some voltage differential between the battery voltage and 7V5-ACC, depending on the current drawn by the accessory.

RXD-ACC

The RXD-ACC line carries data from the accessory connector to the controller during tasks such as radio programming and calibration.

TXD-ACC

The TXD-ACC line is a digital data line from the microprocessor and carries synchronous data from the controller to the accessory connector during tasks such as radio programming and calibration.

SENSE-0-ACC and SENSE-1-ACC

SENSE-0-ACC and SENSE-1-ACC lines are used to detect accessories.

SENSE-0-ACC is used to turn off the radio's internal speaker. To turn off the internal speaker, tie SENSE-0-ACC to GND by shorting link 1 (LK1). The external speaker outputs are always active.

SENSE-1-ACC is used to put the radio in VOX mode when an external voice-operated switch is used to control EXT-PTT (e.g. in a handsfree vehicle kit). To do this, tie SENSE-1-ACC to GND by shorting link 2 (LK2). If the radio is being used in VOX mode on a conventional channel, then EXT-PTT will only be sensed when it is not busy. If the radio is being used on a trunking network, then EXT-PTT will only be sensed when it is on a valid traffic channel. A trunking call must be initiated by an internal key on the radio.

EXT-MIC

The EXT-MIC signal is an analogue input from the microphone of an accessory.

Connecting a microphone to EXT-MIC automatically turns off the radio's internal microphone.

EXT-PTT

The EXT-PTT is an analogue signal from the accessory interface to the control area and indicates an external request for PTT and external function buttons.

GND

The GND pin is the ground point of the accessory connector.

BUTTON-1 and BUTTON-2

Two external accessory function buttons are available, BUTTON-1 and BUTTON-2.

The sensing of the external function buttons is determined by a voltage divider on EXT-PTT. This consists of a 27 kΩ pull up to 5 V inside the radio and a pull down resistor on the accessory PCB. The resistor pull downs for BUTTON-1 and BUTTON-2 are as follows:

- PTT function: resistor pull down 0 Ω, voltage level on EXT-PTT is 0 V;
- BUTTON-1 function: resistor pull down 12 kΩ, voltage level on EXT-PTT is 1.5 V;
- BUTTON-2 function: resistor pull down 27 kΩ, voltage level on EXT-PTT is 2.5 V.

These resistors are already fitted to the accessory PCB.

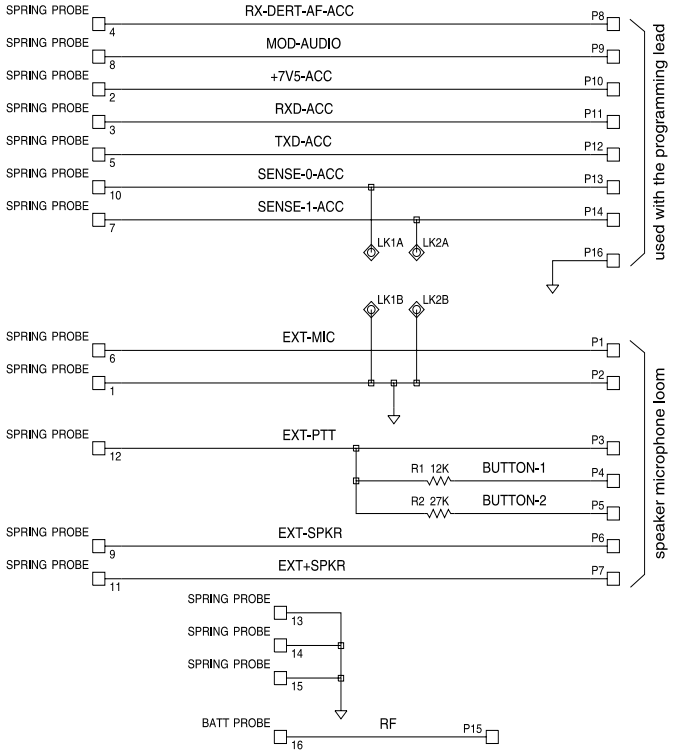
EXT-SPKR +/-

The EXT-SPKR +/- line can be used to drive an external speaker. Neither terminal should be grounded, as the output is differential.

RF

This pin provides a connection for accessories requiring RF, such as the RF speaker microphone. When an RF accessory is connected, the main antenna is switched out.

Figure F-3: Tait Orca accessory connector circuit diagram



7.5 mm Accessory Adaptor

You can connect non-Tait accessories that require a 7.5 mm adaptor to the Tait Orca handportable using the 7.5 mm accessory adaptor (TOPA-AA-005, or TOPA-AA-105 (with D-clip)).

Such accessories use 3.5 mm and 2.5 mm phono plugs with 7.62 mm spacing between them. The speaker and microphone/PTT jacks for the 7.5 mm adaptor are shown in Figure F-4.

To connect an accessory to the Tait Orca that uses PTT in series with the microphone, wire the accessory to a 3.5 mm plug and 2.5 plug according to Figure F-4.

The 7.5 mm accessory adaptor differs from the standard accessory connector in that with the 7.5 mm adaptor, the PTT signal is in series with the microphone signal. The standard accessory connector has separate PTT and microphone signals. If the accessory has function buttons, they will not work with the 7.5 mm adaptor.

The main function of the 7.5 mm adaptor is to demultiplex the accessory's MIC/PTT line into two separate lines for the Tait Orca handportable. The adaptor also detects the presence of the accessory speaker and turns off the radio's speaker.

Figure F-5 shows the circuit diagram for the 7.5 mm accessory adaptor.

When the accessory PTT switch is pressed, it connects the microphone to the adaptor between ground and the base of Q3 (see Figure F-5). This pulls Q3 low turning it on. Q3 in turn pulls the base of Q2 high which pulls the EXT-PTT line low, enabling the transmitter. Audio from the accessory microphone passes through C4 to the radio's EXT-MIC line.

When the accessory speaker is connected, the base of Q1 is pulled high via R3 and R1, turning it on. This pulls the SENSE-0-ACC line low, which tells the radio to turn off the internal speaker, and only the accessory speaker is operational. C1, C2 and C3 filter out the audio signal, so that the voltage swing of the signal will not turn off Q1.

Figure F-4: Plugs for the 7.5 mm accessory adaptor

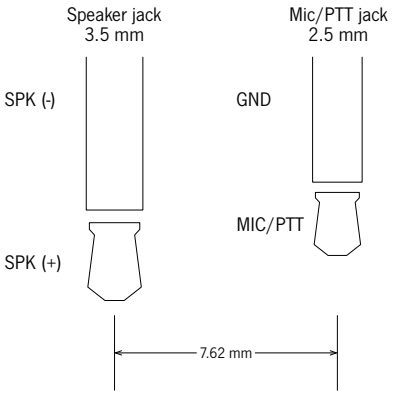
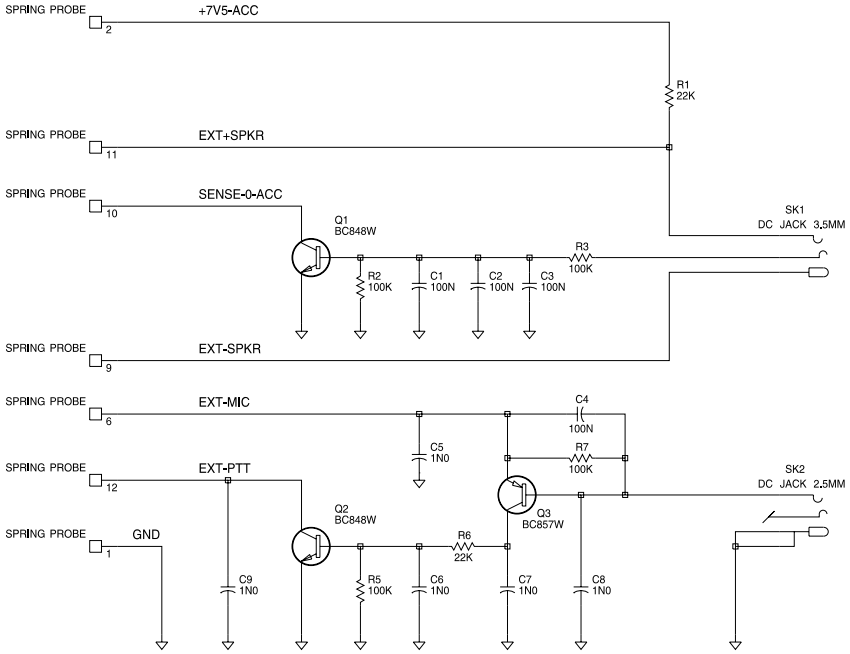


Figure F-5: Tait Orca 7.5 mm accessory adaptor circuit diagram



Tait Orca Vehicle Kit

The Tait Orca vehicle kit provides a secure environment for a Tait Orca handportable used in a vehicle. The vehicle kit allows the radio to be connected to the vehicle's external antenna and also acts as a fast charger for the radio's NiCd battery.

Note that NiMH batteries are not charged by the vehicle kit, and that the desktop fast charger should still be used to short condition NiCd batteries each week.

This section outlines the vehicle kit operation, specifications and servicing. A detailed circuit and interface description is also provided, to allow customised modification of the vehicle kit.

Product Codes

Table F-3 gives the product codes of available vehicle kit options and accessories.

The vehicle kits in Group A include selected mounting options and accessories. These accessories and other installation options are available separately as items in Group B.

Table F-3: Vehicle kit product codes

Product code	Description	
TOPA-VK-002	Vehicle kit, no installation accessories	Group A
TOPA-VK-006	Vehicle kit with mobile microphone & mounting hardware	
TOPA-VK-007	Vehicle kit with mobile microphone, speaker & mounting hardware	
TOPA-VK-008	Vehicle kit with heavy duty mobile microphone & mounting hardware	
TOPA-VK-009	Vehicle kit with heavy duty mobile microphone, speaker & mounting hardware	
TOPA-VK-011	Vehicle kit with heavy duty microphone & speaker (no additional mounting hardware)	
TOPA-VK-010	Vehicle kit mounting adaptor	Group B
TOPA-VK-020	Vehicle kit single height U bracket	
TOPA-VK-030	Vehicle kit double height U bracket	
TOPA-VK-040	Vehicle kit triple height U bracket	
TOPA-VK-050	Vehicle kit mounting plate	
TOPA-VK-060	Vehicle kit charger disable kit	
TOPA-VK-100	Vehicle kit mobile microphone	
TOPA-VK-200	Vehicle kit external speaker	
TOPA-VK-300	Vehicle kit visor microphone	
TOPA-VK-400	Vehicle kit remote PTT	
TOPA-VK-500	Vehicle kit heavy duty mobile mic.	

Installing a Vehicle Kit

Detailed installation instructions are provided in the *Tait Orca vehicle kit installation guide* (IPN 429-40000-xx). This guide is included with each vehicle kit.

Vehicle Kit Operation

Inserting the Radio

Remove the accessory connector cover from the radio.

Ensure the vehicle kit release button is down and insert the radio into the radio cavity.

Push the radio firmly into place against the locating pegs and radio interface. You should hear the radio snap into place and the release button will pop up.

Locking a Radio in the Vehicle Kit

You can use the supplied key to lock the radio into the vehicle kit when you leave the vehicle unattended.

To lock the radio in the vehicle kit, insert the supplied key in the lock and turn it clockwise.

To unlock the radio from the vehicle kit, turn the key counterclockwise.

Removing the Radio

To remove the radio from the vehicle kit, push the release button down. The radio can now be removed from the radio cavity.

Charging the Battery

Once the radio is inserted into the radio cavity, the charger status LED will glow amber for three seconds, then red. When the LED glows green, the battery is charged to a minimum of 70% capacity.

If the battery is too hot or too cold, the LED will glow amber until the battery temperature is within the safe range for recharging (0°C to 50°C). If the indicator remains amber, consider turning on your air conditioning. Optimum battery charging performance is obtained between 15°C and 25°C.

Charge times when the radio is turned off are:

- up to 1½ hours for the 1100 mAh NiCd battery; and
- up to 2 hours for the 1500 mAh NiCd. battery.

You can still use the radio while the battery is being charged, but the charge times will vary, depending on how much the radio is being used.

The vehicle charger functional indicators are summarised in Table F-4.

Table F-4: Charger status LED indicators

Indicator	Meaning
steady green	battery charging
steady green	battery charged to a minimum of 70% capacity
steady amber	charge suspended until battery temperature is within correct range
flashing red	battery not seated properly in the charger, contacts dirty, battery faulty or NiMH battery inserted

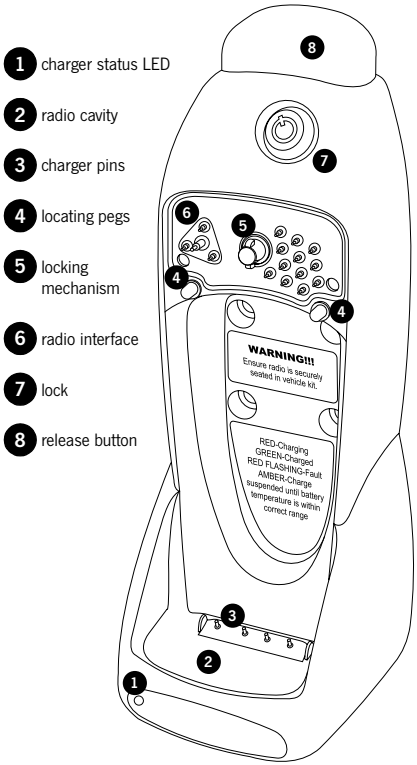


Figure F-6: Vehicle kit assembly

Using the Radio while in the Vehicle Kit

While the radio is seated in the vehicle kit, operation remains the same, except:

- the radio's microphone will be inoperative and an external microphone such as a mobile microphone must be used; and
- the radio's speaker will be inoperative when an external speaker has been installed. Volume can be adjusted from the radio's volume control.

The standard installation results in the charger and external speaker being turned off when the ignition is off.

If the vehicle kit determines that the vehicle's battery is too low (less than 11 V), the vehicle kit will turn off.

WARNING: The vehicle kit uses less than 30 mA from the vehicle's battery when the ignition is off. For this reason, if you are leaving your vehicle unattended for an extended period of time (for example, more than one month), the positive fuse should be removed.

Basic Care and Safety

- It is essential to short condition your battery weekly using the desktop fast charger.
- Wipe the radio contacts and accessory interface with a dry, lint-free cloth to remove any dirt, oil or grease.
- Do not allow the vehicle kit to come into contact with detergents, alcohols, aerosol sprays or petroleum-based products, as they may permanently damage the case.

Vehicle Kit Specifications

The following table outlines the vehicle kit specifications. Details of test methods can be obtained from Tait Electronics Ltd.

Table F-5: General specifications

Supply voltage	13.8 VDC (nominal)
range	11 to 16 V range
protection	3 A fuses in power lead
Ambient temperature range	-10 to +60°C
Battery charger temperature range	0 to +50°C
Weight	375 g
Size W x H x D	80 mm x 230 mm x 95 mm (2 in x 5.8 in x 2.4 in)
Product supported	• all Tait Orca handportables (frequency bands up to 530 MHz supported) • all Tait Orca belt clips • all Tait Orca NiCd batteries Note that NiMH batteries are not charged.
Technical compliance	complies with FCC part 15, CISPR 14 and CISPR 14-2
Fast charger charge current	0.8 A
Charger control	the charger uses voltage, temperature and temperature change to safely charge and maintain battery capacity

Servicing the Vehicle Kit

The vehicle kit contains four PCBs, and the following servicing instructions outline the disassembly of the vehicle kit to allow replacement of these PCBs.

Servicing Warnings: Screw Head Types

There are four different types of Torx screws used in the vehicle kit: KC22x6, KC25x6, KC30x8 and KC30x10. All these screws require a Torx head screwdriver. When tightening any screws, be careful not to strip the threads in the plastic mouldings by exerting too much force.

The following table explains the torque settings required for the different Torx screw types.

Figure F-7: Vehicle kit torque specifications

Screw Type	IPN	Quantity	Torque (in.lb)
KC22x6	346-10022-06	2	2
KC25x6	346-10025-06	3	2
KC30x8	346-10030-08	2	6
KC30x10	346-10030-10	4	6

Removing the Vehicle Kit Back Cover

The back cover is held to the front moulding by two plastic clips at the base of the unit. Insert the tip of a round screwdriver into the two holes at the bottom of the rear panel. Lever the tip upwards towards the top of the unit.

Hold the unit in such a way that your forefinger and thumb exert a slight pressure to separate the rear panel away from the front moulding, while you lever the clips with the screwdriver.

Replacing the Accessory Probe PCB

Remove the back cover and unplug the accessory loom at the top of the options PCB. Unscrew the two KC30x10 screws holding the trigger assembly together. The trigger assembly can now be lifted out.

Note that the trigger assembly must be pressed **downwards** while undoing these screws, as there are springs underneath.

Unplug the loom from the accessory probe PCB. Carefully use narrow nose pliers to unplug the MCX connector from the accessory probe PCB. Now remove the two KC22x6 screws on the front of the vehicle kit holding the accessory probe PCB into the front moulding. The accessory probe PCB can now be tilted upwards and removed from the moulding.

Fit the seal onto the new accessory probe PCB and reassemble the vehicle kit. Read the assembly instructions for more information.

Replacing the Charger Probe PCB

Remove the back cover and unplug the accessory loom at the top of the options PCB. Lift the options/charger PCB assembly out of the front moulding, until the charger loom is accessible.

Unplug the charger loom and remove both PCBs from the front moulding. Note that these PCBs are still attached via the RF cable.

Unscrew the two KC30x8 screws holding the charger probe moulding into the front moulding, and slide out the probe moulding. Unscrew the three KC25x6 screws holding the probe PCB to the probe moulding. Fit the seal onto the new charger probe PCB and reassemble the vehicle kit.

Removing the Options or Charger PCBs

Remove the two DB25 fasteners holding the back panel to the accessory/options connector. Remove the two KC30x10 screws holding the back plate to the audio PA. Unclip the backplate from the options PCB. The PCBs can now be unplugged and replaced.

When putting the options/charger assembly back into the front moulding, make sure that the charger PCB is running in its tracks. Be careful that you do not bump the LED at the bottom of the charger PCB; the PCB does not require any force to insert.

Reassembling the Vehicle Kit

To assemble the vehicle kit, reverse the disassembly process.

Note that when doing up the KC30x10 screws the threads in the plastic PA moulding must **not** be stripped. It is important that the audio PA is held firmly against the backplate, as the backplate serves as a heatsink.

Trigger Reassembly

When reassembling the trigger assembly, insert the peg moulding into the front panel. Insert the quarter turn moulding and rotate it until the peg moulding prevents it from turning. Drop the two springs into the peg moulding. While pressing in the trigger cap, replace the trigger assembly.

While holding the trigger assembly cover together (before doing up the screws) check that the locking mechanism works correctly. To do this, press in the locating pegs and check that the trigger cap pops up. Press the trigger cap down and check that the locating pegs pop out. If the trigger assembly does not work correctly, check that the quarter turn moulding is in the correct position and repeat the assembly process.

Tighten the two KC30x10 trigger assembly screws, while holding the trigger assembly in place.

Rear Cover Reassembly

Locate the top of the rear cover into the back of the trigger assembly. Press the bottom of the rear cover to click/lock the cover into the front moulding.

Spares Kits

The following table shows a list of spares kits which are currently available for servicing Tait Orca vehicle kits. These can be ordered from you local Tait dealer.

Table F-6: Vehicle kit spares kits

Product code	Description
TOPA-SP-301	Vehicle kit spares kit
TOPA-SP-302	Vehicle kit reskinning kit

The contents of these kits are shown in Tables F-6 and F-7.

Note that the 'IPN' column is the ten digit 'internal part number' which uniquely identifies any component used in a Tait product.

The numbers in the 'Legend' column refer to Figure numbers in which the spares item is shown. The numbers in brackets refer to the numbered legend within the figure, where appropriate.

Table F-7: Vehicle kit spares kit (TOPA-SP-301)

IPN	**Description**	**Quantity supplied**	**Legend**
OPA-VK-010	TOP vehicle kit charger PCB	1	F-12
OPA-VK-020	TOP vehicle kit options PCB	1	F-13
OPA-VK-030	TOP vehicle kit accessory probe PCB	5	F-10
OPA-VK-040	TOP vehicle kit charger probe PCB	10	F-11
219-02665-00	Cable - RF (MCX to BNC connectors)	5	F-9
219-02666-00	Cable - charger to charger probe PCBs	5	F-9
219-02667-00	Cable - options to accessory PCBs	5	F-9
240-04021-74	Mobile microphone socket (6-way vertical phone jack)	5	F-8 (3)
240-04021-82	External speaker & remote PTT sockets (3. 5mm DC jack)	10	F-8 (4), F-8 (5)
240-04021-83	Visor microphone socket (2.5 mm DC jack)	5	F-8 (6)
240-04021-85	Power/ignition sense socket (4-way right angle PCB mounting)	5	F-8 (7)
303-11204-00	Chassis moulding	10	–
305-00007-00	Trigger moulding	10	–
305-00008-00	Quarter turn moulding	10	F-6 (5)
305-00009-00	Peg moulding	10	F-6 (4)
305-00010-00	Trigger cap moulding	10	F-6 (8)
305-00021-00	Trigger spring	10	–
305-00022-00	Peg spring	20	–
305-00023-00	Lock	5	F-6 (7)
353-05006-00	Washer 7/16 beryllium	1	–
365-00011-54	White label R1556/2 90 x 24mm	19	–
399-00010-69	Mini grip plastic bag 75 x 100mm	6	–
399-00010-53	Plastic bag 150 x 250mm	8	–
399-00010-86	Static shielding bag 127 x 203mm	2	–
365-00011-38	Yellow static warning label	2	–
937-00000-79	Blazer label 60 x 25.4mm	0	–
410-01153-00	Pkg Carton SII unprinted	1	–

Table F-8: Vehicle kit reskinning kit (TOPA-SP-302)

IPN	Description	Quantity supplied	Legend
305-00003-00	Lens	4	—
305-00004-00	Front moulding	4	—
305-00005-00	Rear moulding	4	—
305-00006-00	Probe moulding	4	—
305-00012-00	Auxiliary seal	4	—
305-00013-00	Probe seal moulding	4	—
305-00015-00	Back plate	4	—
305-00023-00	Lock	4	F-6 (7)
353-05006-00	Washer 7/16 beryllium	1	—
365-01610-00	Front warning label	5	—
365-01611-00	Front operation label	5	—
365-01612-00	Rear type approval label	5	—
365-00011-54	White label R1556/2 90 x 24mm	11	—
399-00010-53	Plastic bag 150 x 250mm	1	—
399-00010-69	Mini grip plastic bag 75 x 100mm	10	—
410-01153-00	Pkg Carton SII unprinted	1	—
937-00000-79	Blazer label 60 x 25.4mm	0	—

Custom Modifications

The following information is provided to enable modifications to be made to the standard vehicle kit installation:

- signal descriptions and specifications for the vehicle kit external connectors;
- block diagrams of the vehicle kit PCBs; and
- circuit descriptions for each vehicle kit PCB.

Detailed circuit diagrams and component location information for the vehicle kit PCBs may be obtained from the Customer Services Division. Contact your Tait dealer for more information.

Using External Function Buttons

It is possible to interface to the radio's external function buttons through any of the vehicle kit's external PTT connections:

- the accessory data connector (SK3);
- the mobile microphone socket (SKT1); or
- the remote PTT socket (EXT-PTT).

A resistor and a switch is needed for each external function button. See "BUTTON-1 and BUTTON-2" on page F-6 for more details.

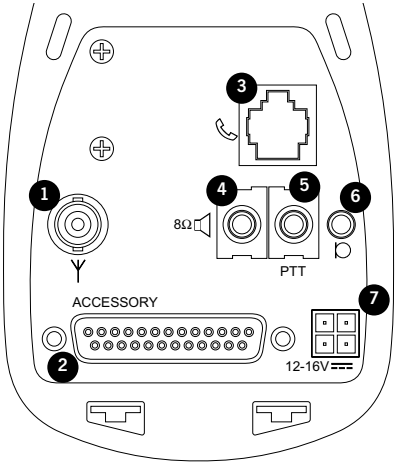
For example, it is possible to modify a standard TOP speaker microphone (e.g. TOPA-AA-001) to allow the use of external function buttons. To do this, add two resistors inside the microphone, disconnect the speaker, and crimp a 6-way phone plug onto the cable.

Setting up 'Hookswitch' Functionality for a Trunked Radio

'Hook switch' functionality can be achieved by programming external function BUTTON-1 to **Clear**. As long as the microphone clip is grounded, then whenever the mobile microphone is on-hook, the call will be cleared down. You must unclip the microphone before a call can be initiated.

Note that you do not need to add any resistors, as the mobile microphone already has an internal 12 kΩ resistor wired correctly.

Figure F-8: Vehicle kit - rear view showing external connectors



1. Antenna BNC connector
2. Accessory/data connector
3. Mobile microphone socket
4. External speaker connector
5. Remote PTT connector
6. Visor microphone connector
7. Power/ignition sense connector

Vehicle Kit External Connectors

The tables on pages F-18 to F-18 document the signals available on all of the vehicle kit's external connectors.

Note that the 25-way accessory/data connector provides access to all of the radio's accessory signals, as well as a few vehicle kit specific signals.

See "Tait Orca 5000 Accessory Connector" on page F-3 for further details about handportable accessory signals.

Table F-9: Vehicle kit power connector (SK1 on the charger PCB)

Pin	Signal	Description
1	N/C	–
2	GND	Main ground connection
3	IGN	Switched accessory power - connect to permanent power to disable ignition sense
4	+13V8	Main connection to +13.8 V (vehicle battery). Use 3 A fuses.

Table F-10: Vehicle kit mobile microphone connector (SKT1 on the options PCB)

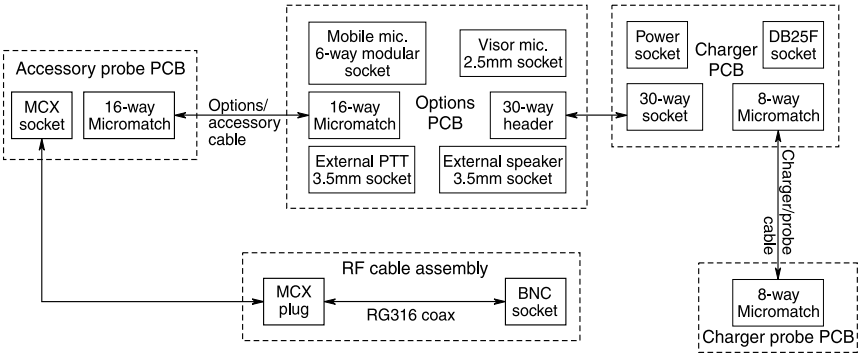
Pin	Signal	Description
1	+13V8LIM	Power out Zout = 10 Ω; 100 mA maximum
2	N/C	–
3	EXT-PTT	External PTT and function buttons*
4	MOB-MIC	Dynamic microphone input impedance = 600 Ω
5	GND	Ground
6	N/C	–

* EXT-PTT is pulled high inside the radio by 27 kΩ. Function buttons are implemented by pull-downs to ground. For BUTTON-1, R = 12 kΩ; for BUTTON-2, R = 27 kΩ.

Table F-11: Vehicle kit accessory/data connector (SK3 on the charger PCB)

Pin	Signal	Description
1	GND	Signal ground
2	RX-IN	RS-232 Receive data to radio
3	TX-OUT	RS-232 Transmit data from radio
4	N/C	–
5	BUSY	Radio receiving low = busy (including beeps)
6	AUDIO-D25	Single ended audio. Zout = 3 kΩ; AC coupled
7	GND	Signal ground
8	EXT-MIC-D25	Microphone input Zin = 1 kΩ
9	MOD-AUDIO	To modulator
10	EXT-PTT	PTT and function buttons low = PTT
11	SPKR-OFF	Turns radio and external speaker off low = off
12	RX-DET-AF	Detected receive audio (unmuted)
13	GND	Signal ground
14	+5V	5 V power 25 mA maximum
15	+7V5-ACC	7.5 V from radio 25 mA maximum
16	SENSE-0-ACC	Radio internal speaker control low = off
17	SENSE-1-ACC	–
18	SPKR+	Balanced output from audio PA
19	SPKR-	Balanced output from audio PA
20	N/C	–
21	N/C	–
22	N/C	–
23	N/C	–
24	LVSD	Low voltage shut down - turns off vehicle kit
25	+13V8FILT	13.8V power 500 mA maximum

Figure F-9: Vehicle kit interconnection diagram



Vehicle Kit Circuit Descriptions

This section provides an outline of the design and describes the modular assembly of the vehicle kit. The vehicle kit contains four PCBs:

- the accessory probe and charger probe PCBs, interfacing to the radio and battery; and
- the charger and options PCBs, containing the electronic circuitry.

A block diagram showing how the four PCBs interconnect and naming the connectors on each PCB is shown in Figure F-9.

The following subsections and their associated diagrams expand on the functionality of each vehicle kit PCB.

Vehicle Kit Accessory Probe PCB (IPN 220-01506-xx)

This PCB provides the interface to the handportable accessory connector. The audio/ control signals connect to the options PCB via a 16-way Micromatch ribbon cable. The RF signal is routed via an MCX connector and coaxial cable to a BNC connector on the rear of the vehicle kit. A block diagram of this PCB is shown in Figure F-10.

Figure F-10: Vehicle kit accessory probe PCB block diagram

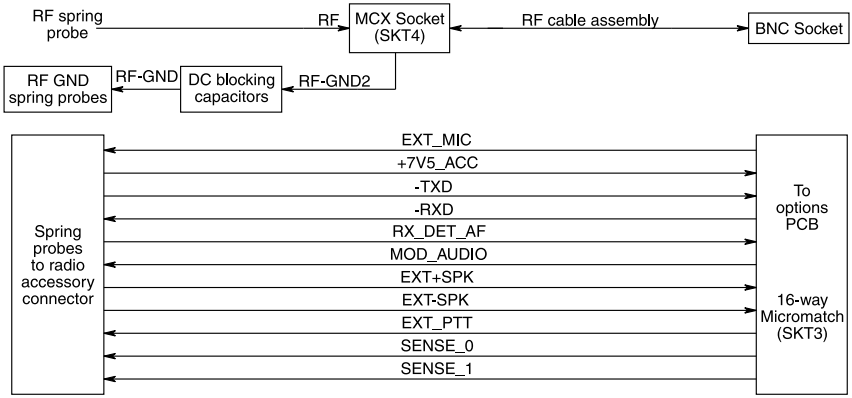
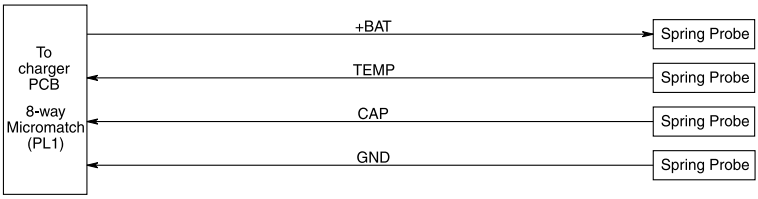


Figure F-11: Vehicle kit charger probe PCB block diagram



Vehicle Kit Charger Probe PCB (IPN 220-01564-xx)

This PCB provides the interface to the radio battery for charging and is connected to the charger PCB via an 8-way Micromatch ribbon cable. A block diagram of this PCB is shown in Figure F-11.

Vehicle Kit Charger PCB (IPN 220-01504-xx)

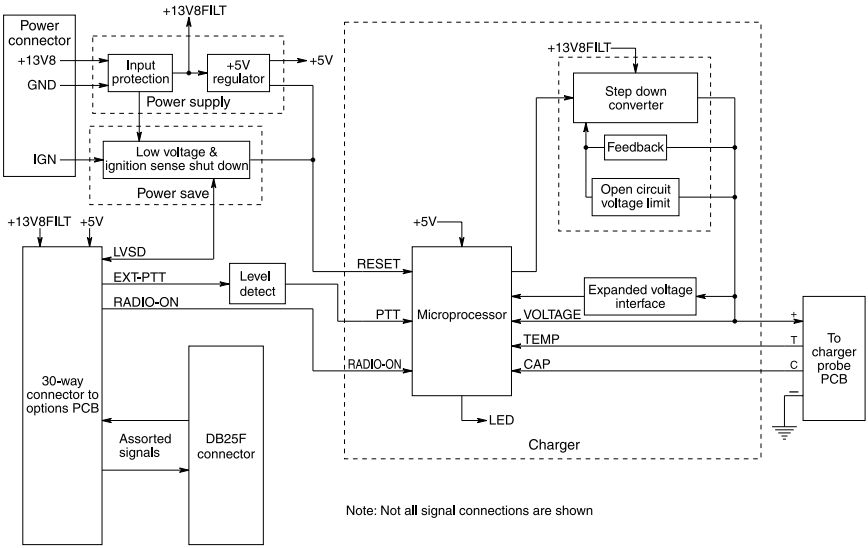
This PCB contains the fast charger circuit module, the majority of the power supply module and about half of the power save module. A block diagram of this board is shown in Figure F-12.

Current Source

The switch mode current source is based around a Maxim MAX1627 100% duty cycle, high efficiency, step down DC-DC controller (IC4). The core of the current source is a Buck converter consisting of Q9, L2, C46, C47 and D5. The feedback for the controller (IC4) is via current sense resistors (R58, R59) and a differential amplifier (IC5:B).

In steady state, approximately 0.8 A flows through R58 and R59, generating a voltage which is amplified by the differential amplifier, IC5:B. The output of this is fed into pin 2 of IC4 (FB). The threshold of the feedback input (IC4 pin 2) is 1.3 V, relative to VGND. When the feedback signal on pin 2 is above 1.3 V, the controller (IC4) turns off Q9. Similarly, when the feedback signal is below 1.3 V, the controller turns on Q9.

Figure F-12: Vehicle kit charger PCB block diagram



D4 and R46 create a virtual ground (VGND) and protect the MAX1627 from over voltages. Conducted noise is filtered by C42, C43 and L5. The blocking diode, D6, stops the radio battery from powering the vehicle kit when the current source is off.

The radio is protected from over voltages at the battery terminal by IC5:C, IC5:D and their associated circuitry. If the voltage at the output (BAT1) reaches approximately 10.3 V, then Q3 is turned on by the Schmitt trigger IC5:D. This changes the feedback from current controlled (via IC5:B) to voltage controlled (via IC5:C). The non inverting amplifier of IC5:C is configured such that it overrides the output of IC5:B and sets the output voltage to approximately 10.6 V.

The current source is normally controlled by the micro controller (IC3). When pin 20 goes low, the current source is turned on.

Fast Charger Micro Controller

IC3 is a 68HC05 based micro controller, which runs custom charger software to control the current source and intelligently monitor the charge state of the battery. Note that this software behaves differently from the desktop fast charger software. When working correctly the microcontroller will always make the LED glow orange for 3 seconds whenever power is reapplied.

The line into IC3 pin 1 (RESET) is used by the 5 V regulator (IC1) to control the startup of IC3. RESET is only released by IC1, once power has stabilised and the circuits are powered up. The RESET line is also controlled by the power save circuity, so that the fast charger can be turned off.

The control line for the current source is IC3 pin 20, with low being on and high impedance being off. This line controls the current source, via Q7.

The coarse voltage input used for general voltage measurements is IC3 pin 16. The expanded voltage input used for fine voltage measurements is IC3 pin 17. Battery temperature is measured via IC3 pin 18. This pin is pulled to ground via a 10 kΩ (nominal) thermistor inside the battery case. The battery capacity input used to tell the charger whether the battery is NiCd or NiMH is IC3 pin 19.

The line to IC3 pin 7 is an input which tells the micro controller when the vehicle kit PTT is activated. The line to IC3 pin 9 is an input which tells the micro controller when the radio is on.

Vehicle Kit Power Supply Input Protection

Power to the circuit (13.8 V nominal) is provided through a Mini Fit Molex connector. Protection circuitry consists of a 22 V transient suppressor (D1) and a 2.5 A polyswitch (PS1). C11 and C12 provide some filtering of the input power.

Over voltage protection is also provided by D1. Short transient over voltage (>22 V) pulses will be clamped by D1, preventing harm to the circuit. Longer sustained over voltage conditions, such as incorrect connection to a 24 V vehicle supply, will cause D1 to conduct and eventually fail to a short circuit state. This will result in a power lead fuse blowing or PS1 tripping, if the fuses are of the incorrect rating (> 3A) or not fitted (i.e. the line is shorted).

Vehicle Kit Power Supply 5 Volt Regulator

IC1, an L4949, is the 5 V regulator for the vehicle kit and produces the +5 V rail. It also controls the RESET line of the micro controller under startup and will reset the micro controller if there are any voltage dips. C13 is fitted to improve output noise and transient response. C14 sets the reset delay time. The tantalum capacitor C15 maintains the stability of the output voltage. The maximum current available from the +5 V rail is 100mA.

Vehicle Kit Power Supply Power Save

The low voltage shut down (LVSD) circuitry on the charger PCB is used to power down sections of the vehicle kit under various condi-

tions. If the vehicle battery gets below 11 V, the Schmitt trigger built around IC2:A will go high, turning on Q1 and pulling the RESET line low. This will turn off the fast charger to conserve the vehicle battery. The output of IC2:A is also feed to the options PCB and the base of Q6. This puts the audio power amplifier (IC4) into standby to conserve the vehicle battery.

The ignition sense input to the charger PCB (IGN on pin 3 of the power connector) can be used to turn off the vehicle kit when the vehicle ignition is off. If IGN is wired to permanent power, then this feature is disabled. If IGN is wired to switched accessory power, then when the ignition is off the fast charger and the audio power amplifier are turned off via IC2:A.

LK4 is not fitted. It can be used to disable ignition sense for bench testing.

The diode (D2) in the feedback path of IC2:A is used to increase the hysteresis of the Schmitt trigger. Thus when low vehicle battery voltage triggers IC2:A, the vehicle battery must recover by approximately 1 V above the threshold before the vehicle kit will be powered up.

Note that to adjust the LVSD threshold, voltage divider R22, R24, R25 and R26 must be changed.

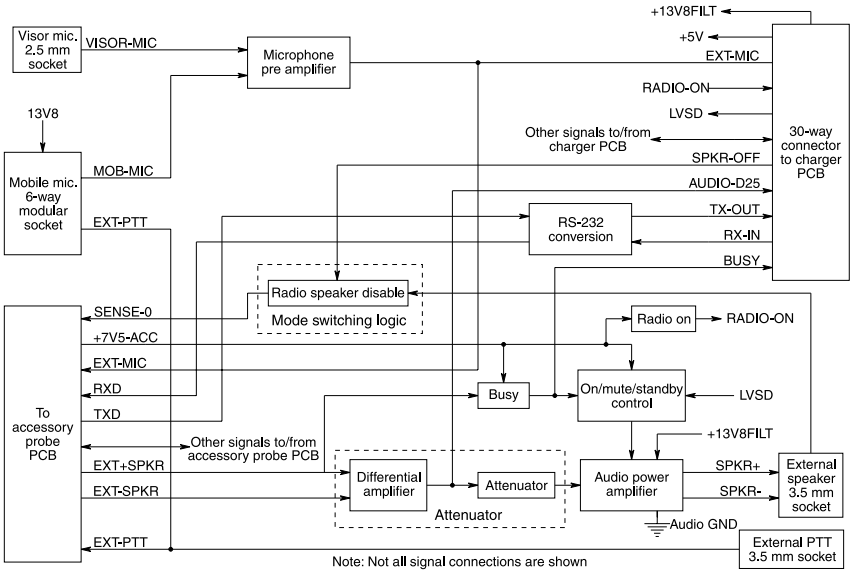
Vehicle Kit Options PCB (IPN 220-01505-xx)

This PCB contains the mode switching logic, the microphone pre-amp, the RS-232 conversion module, the audio power amplifier with its associated input circuitry and the mute/standby module. A block diagram of this board is shown in Figure F-13.

Audio Power Amplifier and Associated Circuitry

The audio power amplifier takes the differential audio available at the radio accessory pins and amplifies it to drive an external speaker. The first stage is a differential amplifier (IC2:B) with a gain of -6 dB (0.5). This produces a single ended audio signal at pin 7 which is tapped off along two paths. The first path is via the voltage divider R69 and R68 which attenuate the signal by a factor of 100 (-40 dB). This signal is then AC coupled into IC4 which is configured for Bridge Tied Load (BTL) operation and has a fixed gain of 46 dB (200). IC4 is a Philips TDA1519A car audio power amplifier chip.

Figure F-13: Vehicle kit options PCB block diagram



Note that the recommended method for changing the gain of the audio power amplifier is to adjust the ratio of the voltage divider formed by R69 and R68.

The second path for the single ended audio signal present at pin 7 of IC2:B is via R78 and C52, to become the AUDIO-D25 signal. This signal has its output at pin 6 on the D25 connector on the charger PCB. The minimum input impedance of a circuit that connects to AUDIO-D25 is 6k Ω. The recommended input impedance would be 47k Ω.

The audio PA has three modes of operation (standby, mute and on) which are set by the voltage at pin 8. A pull-up for the on mode is provided by R75, while Q3 controls the mute mode, by switching in R73 to form a voltage divider with R75. Q4 pulls IC4 pin 8 low to control the standby mode. The following table summarises the PA operation.

Table F-12: Vehicle kit option PCB - audio PA operation

Mode	Voltage Level	Controlled By
On	> 8.5 V	Q3: off Q4: off R75: Pull up
Mute	3.3 V - 6.4 V	Q3: on Q4: off R75/R73: divider
Standby	< 2 V	Q4: on

When the audio PA is in either the mute or on mode, its outputs (pins 4 & 6) are biased with a DC level of approximately 6.5 V.

A BUSY signal is created by looking at the DC bias on the EXT+SPKR signal. IC2:A is configured as a Schmitt trigger and is used to produce the BUSY signal (pin 1). R67 and C27 provide filtering of the audio signal so that IC2:A is not falsely triggered by large audio peaks. The reference signal is produced from +7V5-ACC via the voltage divider of R65 and R66.

The 7V5-ACC signal is accessory power from the radio and indicates if the radio is switched on. If there is no 7V5-ACC signal then the audio PA is held in its standby mode via Q7 and Q4. When the DC bias is absent from EXT+SPKR, BUSY is high and the audio PA is held in its mute mode via Q3. The audio PA can also be put into standby mode via the SPK-CUT control signal being high. Q4 will always over ride Q3.

Putting the audio PA into standby is part of the power save feature of the vehicle kit. LVSD is a control line from the charger PCB which goes high when the vehicle battery is too low (<11V). If LVSD is high then the audio PA is put into standby mode via Q6, Q7 and Q4.

A 3.5mm stereo phono socket is used to connect the external speaker. When the mono plug of an external speaker is attached, the middle connection of the stereo socket (SPKSENSE) is shorted to one of the audio PA output signals. When the audio PA is operating there is a DC bias of approximately 6.5 V (half rail) on both of its outputs. This bias is used to turn on Q5, which pulls SENSE-0-ACC low, disabling the radio's internal speaker.

The D25 connector has a control line called SPKR-OFF on pin 2. If the accessory connected to the D25 connector has a speaker, then by pulling SPKR-OFF low all other speakers can be disabled. The SPKR-OFF signal is inverted by Q9 to produce SPK-CUT. If SPK-CUT is high, then the audio PA will be placed in standby mode via Q4 (which turns off an external speaker if it is connected). SENSE-0-ACC is pulled low to disable the radio's internal speaker.

Microphone Pre-Amp

A capacitor multiplier formed by Q2, R2 and C19 is used to filter the +5 V supply producing +5V-FIL which is used to provide DC bias for the microphones via R3 and R22.

The internal microphone in the radio is disabled by an impedance to ground, which is typically the electret microphone of a speaker microphone. In the vehicle kit this is accomplished by R28, which is connected to the EXT-MIC-D25 line. Thus whenever the radio is in

the vehicle kit the internal microphone is disabled.

RS-232 Conversion

An RS-232 level 3 wire serial port is provided at the DB25 connector (TX-OUT, RX-IN, GND), for use by devices such as data terminals. The radio provides CMOS level serial communications via the RXD and TXD signals. These signals are converted to full RS-232 voltage levels (i.e. +10 V for a logic 0, and -10 V for a logic 1) by IC3.

PART G

Additional information

This part provides reference information, including a glossary of terms.

Contents

Glossary

active

The 'on' (asserted) state of a signal or indicator.

ADC

Analog to digital converter. An electronic device that outputs binary data dependant upon the magnitude of voltage input.

brownout

A dip in the supply voltage sufficient to put the control section into hardware reset.

calibration

The process of determining the **calibration data** for a radio. Calibration is normally only carried out during product manufacture or major service.

calibration data

The set of coefficients for each of the electronic tuning variables, as a function of frequency, which allows the radio to calculate the **configuration data** for any frequency it operates on. The **calibration data** is unique for each radio.

call

A complete exchange of information between two or more parties. In **trunked mode**, this may occur on the **control channel** or on a **traffic channel**.

CCTM

Computer controlled test mode. The operating mode of the radio whereby computer equipment can control various radio functions by sending commands down a serial link to the radio.

channel

A receive/transmit frequency pair.

configuration

The determination and setup of the **configuration data** for a given frequency from the programmed **calibration data** (i.e. electronic tuning).

configuration data

The data set corresponding to the value of the electronic tuning variables on a given channel. This is calculated for each frequency from the **calibration data**.

control channel

The **channel** used by a **trunking system** to control the radio.

conventional mode

The mode of operation whereby the radio behaves as a conventional two-way radio (i.e. non-trunked operation).

CTCSS

Continuous tone controlled subaudible signalling. Continuous, subaudible coding on the channel for the purpose of segregating user groups.

DAC

Digital to analog converter. An electronic device that outputs a voltage dependent upon the value of binary data input.

database

The set of programmable data points that allows the product to be customised for a particular application or mode of operation.

Note: Terms that appear in **bold sans serif** font are also defined in this glossary.

DC

Direct current.

DCS

Digitally coded squelch. Continuous, subaudible coding (repeating digital code sequence) on the **channel** for the purpose of segregating user groups.

delayed

Key action. The input is not actioned until it has been stable for the duration of the debounce interval.

dialled string

A sequence of characters entered via the keypad. May contain **numbers**, **labels**, '*' or '#'. Used to initiate **calls** or invoke special functions.

dialling

The act of entering a number or label by typing in successive characters on the keyboard.

DSP

Digital signal processor.

DTMF

Dual tone multiple frequency. Method of encoding digits (0 to 9) and characters (A to F), each as a pair of eight standard tones.

economy mode

When the radio is cycling between the **receive mode** and **standby** state. Available on Tait Orca conventional handportables.

ECR

External call request.

EPROM

Erasable programmable read only memory.

EPTT

External press-to-talk.

ESN

The MPT1343 defined electronic serial number of the radio.

FFSK

Fast frequency shift keying. The signalling method employed in trunked radios. Data is represented by 1 cycle of 1200 Hz (logic 1) or 1.5 cycles of 1800 Hz (logic 0) and is transmitted at 1200 baud.

fixed (indicators)

Do not time out of their own accord. Generally indicate mode of operation or state.

idle

The state of the radio in **trunked mode** when it is not engaged in a call or call setup, or in **conventional mode** when the radio is not transmitting.

IF

Intermediate frequency.

inactive (indicator)

The 'off' (unasserted) state of a signal or indicator.

label

A plain language word (1 to 8 characters long) that is defined to represent a valid dialled string at radio programming time.

LCD

Liquid crystal display.

LED

Light emitting diode.

LPF

Low pass filter.

MCU

Micro control unit.

mute

The receive audio gating element. When active, receive audio is passed to the speaker. The decision to activate/deactivate the audio signal path is based on an evaluation of signalling codes (**CTCSS**, **DCS**, **Selcall**) contained in the audio information (contrast with **squelch**).

number

A simple **string** that corresponds to an MPT1343 defined called party identifier.

PA

Power amplifier.

PABX

Private automatic branch exchange.

PCB

Printed circuit board.

PLL

Phase locked loop.

PLCC

Plastic leaded chip carrier.

PMR

Private mobile radio.

programming mode

The mode of operation of the radio in which computer equipment can read from and write to the radio **database**.

PSTN

Public switched telephone network.

RAM

Random access memory.

receive mode

This is the state wherein the radio is producing a valid busy output, irrespective of whether any audio output is produced at the speaker terminals. The +5V-ECON supply is on, and sufficient time has elapsed for various circuit blocks to settle.

RF

Radio frequency.

RSN

The radio's unique serial number.

RSSI

Received signal strength indicator.

SCI

Serial communications interface. This is the serial interface from the radio to an external device, normally utilising transmit and receive data, signal and ground lines.

Selcall

Selective calling. Sequential tone burst coding on the channel for the purpose of selecting an individual or group with which to communicate.

selecting

The act of picking a **label** from a displayed list using the arrow keys.

signalling

Non-voice coding on the channel for the purpose of identifying parties and/or segregating user groups, e.g. **CTCSS**, **DCS**, **Selcall**.

SMD

Surface mount device.

SOIC

Small outline integrated circuit.

SOT

Small outline transistor.

squelch

The channel busy detection circuitry. The decision to activate/deactivate the audio signal path is based on a signal-to-noise measurement on the received **RF** signal (the squelch circuitry precedes the **mute** circuitry).

standby state

This is essentially when the +5V-ECON line is off. That is, when the radio is drawing the minimum current, while still being switched on.

string (simple)

A sequence of the characters 0 to 9, *, #, which instructs the radio to initiate a call or perform some other function.

successful (call)

A **call** for which a **traffic channel** is assigned.

system restart

The action taken by the radio (e.g. in response to the '^' character received on the **SCI**) where it immediately ceases current operation, then behaves as though it has just been switched on.

TCXO

Temperature compensated crystal oscillator (voltage controlled). The frequency reference for the **RF** part of the radio.

test mode

The operating mode of the radio whereby computer (computer equipment can control various radio functions by sending controlled) commands down a serial link to the radio.

traffic channel

The channel used by the radio for the duration of a **call**.

transmit mode

The radio has validated a request and commenced or completed the sequence of switching out of **receive mode**. This does not necessarily imply that **RF** is being generated.

trunked mode

The mode of operation of the radio whereby the radio obeys commands on the **control channel** and generally operates as proscribed in MPT1343.

trunking system

The infrastructure comprising repeaters and radios required to support a number of **control channels** and **traffic channels**.

VCO

Voltage controlled oscillator. The oscillator that generates either the on-channel signal to drive the transmitter, or the local oscillator to mix incoming **RF** signals to the **IF** of the radio. The instantaneous frequency of the VCO is determined by a combination of the synthesiser (**PLL**) and the modulation signals TCXO-MOD and VCO-MOD.

VOX

Voice operated transmit.

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