FCC ID: CASTEL0015
2.983 (d)(8) 2nd of 2 (SERVICE)

FCC ID: CASTEL0015
2.983 (d) BLOCK DIAGRAM

FCC ID: CASTEL0015
2.983 (d) CIRCUIT DESCRIPTIONS

FCC ID: CASTEL0015
2.983 (d) SCHEMATICS

Contents

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Part B: Radio specifications and circuit descriptions

Part C: Diagnostics and fault finding

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PART A Introduction

Contents

Servicing Tait Orca handportables

The Tait Orca series of handportable radios is a range of high performance, microprocessor-controlled radios manufactured using RF-shielded PCBs and high-density SMD componentry.

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

- PTT keypad
- speaker
- antenna connector
- channel selector switch
- volume control switch
- microphone
- speaker contacts
- battery contacts
- PTT (internal)
- auxiliary flex
- RF out assembly.

The service repair of PCB-related faults is the sole responsibility of the Customer Services Division of Tait Mobile Radio. See your Tait dealer for information on returning faulty radios to the Customer Services Division.

What does this manual contain?

This manual provides the following:

- general information and specifications on the Tait Orca series of handportable radios;
- basic circuit descriptions;
- information on finding and servicing of non-PCB-related faults;
- information on Tait Orca charging accessories;
- information on interfacing accessories to Tait Orca handportables;
- instructions for uploading radio firmware: and
- a glossary of key terms.

What is included in the service kit?

The service kit contains:

- calibration test unit (TOPA-SV-004);
- radio calibration cable for connecting the radio to the calibration test unit (OPA-SV-007);
- RS232 to modular phone jack cable for connecting the calibration test unit to a PC (OPA-SV-012);
- DC service adaptor (OPA-SV-005);
- SMA N-type RF test lead for connecting to the radio's antenna connector (OPA-SV-006);
- T6 driver bit and 8 mm socket (OPA-SV-011);
- this manual;
- *User's Manual: Calibration System for Tait Orca Radios* (IPN 439-52000-xx);
- a 3.5-inch high density 1.44 MB calibration system install disk (???????); and
- a 3.5-inch high density 1.44 MB radio download program install disk (???????).

Other items required for calibration but not included as part of the service kit are:

- RF communications test set (e.g. HP8920, MI2945/55, CMS52);
- digital current meter capable of measuring current up to 3 A accurate to two decimal places.;
- DC power supply, 7.5 V, 3 A for handportable radios; and
- DC power supply, 13.8 V, 7 A for mobile radios.

Conventions

The conventions shown in the table below are used throughout this manual.

Convention	Description	Example
Bold sans serif	Software screen and menu names, screen buttons, and computer keys	Check that the information in the **Radio Model** fields (**Specifications** screen) is correct.
Bold serif	Commands you must type, computer directories and files	To run the <thingee>, type **orcaxxxx** at the DOS prompt.
<in brackets>	Placeholders for information you must provide	Type c:\<pathname>**orcaxxxx** where you must provide the pathname.
'in single quotes'	Specific entries and available settings for screen fields	The bar at the bottom of the window will initially read 'Default'.
ALL CAPITALS	Specific radio mode settings and names of computer directories and files	The default directory is ORCA\XXXX.

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Important information

Basic servicing precautions

Tait Orca handportable radios require specialised servicing techniques and should only be serviced at an approved Tait service centre equipped with the necessary facilities.

Standard anti-static procedures should be followed: a typical setup is shown in Figure A-1.

If in doubt, contact Tait Electronics Ltd or your nearest Tait dealer.

Warning!!!

Repairs attempted with incorrect equipment or by untrained personnel may result in permanent damage.

Caution: CMOS devices

This equipment contains CMOS devices which are susceptible to damage from static charges. Care when handling these devices is essential. For correct handling procedures, refer to manufacturers' data books covering CMOS devices, such as *Philips Data Handbook Covering CMOS Devices* or *Motorola CMOS Data Book Section 5 (Handling Procedures)*.

Screw head types

Pozidriv recess head screws and Torx recess head screws require the correct sized driver to achieve best performance.

The screws that secure the front panel to the chassis are M2*8 mm Pan Pozi screws, and the screw that holds the PCB to the chassis is an M2*5 mm Pan Pozi screw. Use a Pozi 1 driver set to 2 inch pounds to remove and replace them.

The screws that hold the speaker mounting bracket to the inside of the front panel are 1.8*5 mm Torx head screws. Use a Torx T6 driver set to 2 inch pounds to remove and replace them.

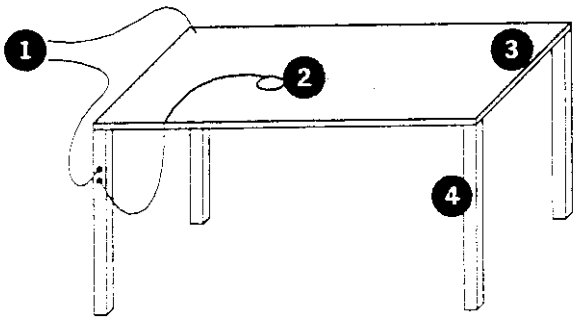
Programming

For information on programming Tait Orca handportable radios, refer the *User's Manual: Programming System for Tait Orca Conventional Radios* (IPN 439-51100-xx) or the *User's Manual: Programming System for Tait Orca Trunked Radios* (IPN 439-51200-xx).

Calibrating

For information on calibrating Tait Orca handportable radios, refer to the *User's Manual: Calibration System for Tait Orca*

Figure A-1: Typical anti-static bench setup



1. to building earth (not mains earth) via 1M series resistor
2. conductive wrist strap
3. conductive rubber bench mat
4. metal frame

Radios. The calibration system is supplied as part of the service kit.

Test facilities

Standard test facilities provide a way of testing the radio's functions independently of normal radio operation. See pages 21 to 29 for a description of the test facilities available for Tait Orca handportable radios.

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The Tait Orca series of handportable radios

There are three Tait Orca series handportable radios available:

- the Orca Elan;
- the Orca Excel; and
- the Orca Eclipse.

At the time this manual was published, only the Orca Elan was available. Therefore, this manual does not include information specific to Orca Excel and Orca Eclipse handportable radios. When these radios are released, a revision of this manual will also be released.

Information on the Orca Elan that was not available at the time this manual went to print will be included with this manual as an insert (IPN 410-51000-xx).

Product codes

The digits in the Tait Orca product code provide information about the radio's model number and various hardware options, according to the convention outlined in Figure A-2. The naming convention is not intended to imply that any particular combination of radio features is at present available or planned for later release. For more information on what features are available, contact your nearest Tait dealer.

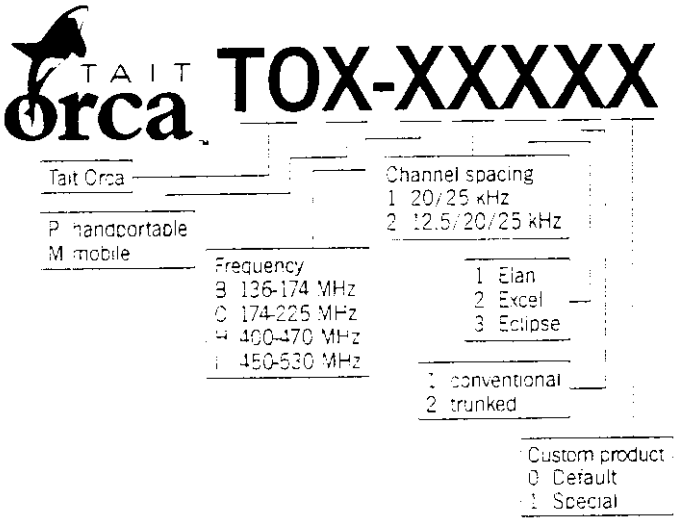
Operating instructions

A user's manual is available for each radio. These are available under the following IPNs:

Conventional handportable
Orca Elan user's manual (IPN 409-00110-0x)
Orca Excel user's manual (IPN 409-?????-0x)
Orca Eclipse user's manual (IPN 409-?????-0x)

Trunked handportable
Orca Elan user's manual (IPN 409-?????-0x)
Orca Excel user's manual (IPN 409-?????-0x)
Orca Eclipse user's manual (IPN 409-?????-0x)

Figure A-2: The Tait Orca handportable naming convention



Accessories

The following accessories are available for Tait Orca handportable [include IPNs]:

- Antennas (IPN ???-?????-??)
- Audio accessories
  - Lapel speaker microphones (IPN ???-?????-??)
- Carrying accessories
  - Belt clip (IPN ???-?????-??)
  - Heavy duty carry case (IPN ???-?????-??)
  - Heavy duty holster (IPN ???-?????-??)
- Batteries
  - Standard NiCd battery pack (IPN ???-?????-??)
  - Heavy duty NiCd battery pack (IPN ???-?????-??)
  - High capacity NiMH battery pack (IPN ???-?????-??)
- Battery chargers
  - Desktop fast charger (IPN ???-?????-??)
  - Desktop trickle charger (IPN ???-?????-??)
  - Multi-charger (IPN ???-?????-??)

Of these accessories, only the chargers are serviceable. Details on servicing chargers is available on pages 45 to 52.

The three battery packs are described on page 46.

Fitting an accessory

To fit some accessories to the radio, you will need to remove the rear accessory cover. Remove the battery, then insert the end of a key underneath the bottom edge of the accessory cover. Lift to remove the cover.

When attaching or removing an accessory, ensure that the lever is in the upright position. Once the accessory is in position, rotate the lever 90 degrees counterclockwise to lock it in place.

Fitting a non-Tait accessory

See pages 53 to 60 for information on using non-Tait accessories with Tait Orca handportable.

PART B Radio specifications and circuit descriptions

Contents

Radio specifications

The performance figures outlined in Tables 1 to 3 are typical figures, unless otherwise stated, for equipment operating at standard room temperature. Where applicable, the test methods used to obtain the performance figures are those described in the European specifications ETS 300-086 (check this).

Details of test methods and the conditions that apply for type approval testing in all countries can be obtained from Tait Electronics Ltd.

Table B-1: General specifications

Size W x H x D (including standard NiCd battery)	62 mm x 150 mm x 44 mm	
Weight (including standard NiCd battery and belt clip)	495 g	
Switching band	B	136-174 MHz
	C	174-225 MHz
	D	220-270 MHz
	E	270-310 MHz
	G	336-400 MHz
	H	400-470 MHz
	I	450-530 MHz
Frequency increments	5, 6.25 kHz	
IF bandwidth		
narrowband	9 kHz	
medium/wideband	20 kHz	
Number of channels		
Elan	16	
Excel	100	
Eclipse	>100	
Channel spacing	12.5/20/25 kHz	
	20/25 kHz	
Supply voltage	6.0-9.0 V	

Standard test voltage	7.5 V
Battery capacity	
Standard	1100 mAh
High capacity	1500 mAh
NiMH	1850 mAh
Battery life @ RF power Low (1 watt)*	
Standard	10.5 hours (5/5/90) 7 hours (10/10/80)
High capacity	14 hours (5/5/90) 9.5 hours (10/10/80)
NiMH	16 hours (5/5/90) 11 hours (10/10/80)
*conventional radio with medium economy cycling enabled	
Battery life @ RF power High (4 watts)*	
Standard	3 hours (5/5/90) 4.5 hours (10/10/80)
High capacity	10.5 hours (5/5/90) 6.5 hours (10/10/80)
NiMH	13 hours (5/5/90) 8 hours (10/10/80)
*conventional radio with medium economy cycling enabled	
Temperature range	-30°C to +60°C
Frequency stability	±2.5 ppm over temperature range

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Table B-2: Receiver performance

Sensitivity	
12 dB SINAD	-117 dBm (minimum) -120 dBm (typical)
20 dB psopho	-114 dBm (minimum)
Audio	
Minimum load impedance	13Ω
Rated power	500 mW (1 kHz, 60% deviation into 16Ω)
Distortion	<5% (1 kHz, 60% deviation at rated power into 16Ω)
Response	-6 dB/oct * 1, -3 dB (cf 1 kHz) 300 - 2550
Selectivity	
to 225 MHz	70 dB (narrow) 75 dB (medium) 75 dB (wide)
UHF	66 dB (narrow) 72 dB (medium) 72 dB (wide)
Spurious responses	70 dB
Intermodulation	65 dB
Blocking	-13 dBm
Spurious emissions	
to 1 GHz	-57 dBm (conducted and radiated)
1 to 4 GHz (136-470)	-47 dBm (conducted and radiated)
1 to 12.75 GHz (>470)	-47 dBm (conducted only)
Group delay variation	~50 µs (at detected audio output) bandwidth 300 Hz to 3 kHz
Hum and noise	40 dB
RSSI	
range	-120 to -40 dBm
slope	28.65 mV/dB (typical)
Squelch	
sitivity	16 dB$_{SINAD}$ fixed
country	12 dB$_{SINAD}$ fixed

Table B-3: Transmitter performance

Power output	
136-174 MHz	1 W (low) 2.5 W (medium) 5 W (high)
174-530 MHz	1 W (low) 2.5 W (medium) 4 W (high)
800 MHz	1 W (narrow) 3 W (high)
Duty cycle	20% (1 minute Tx, 4 minutes Rx at maximum temperature and voltage)
Spurious emissions	
to 1 GHz	-36 dBm (conducted and radiated)
1 to 4 GHz (136–470)	-30 dBm (conducted and radiated)
1 to 12.75 GHz (470–870)	-30 dBm (conducted only)
Adjacent channel	
narrow	60 dBc
medium	70 dBc
wide	70 dBc
Group delay variation	±50 µs (at mod audio output)
bandwidth	300 Hz to 3 kHz
Deviation limiting	±5 kHz (adjustable up to)
narrow	±2.5 kHz
medium	±4.0 kHz
wide	±5.0 kHz
Trunking data deviation (as per MPT1327)	
narrow	1.6 kHz
medium	2.4 kHz
wide	3 kHz
FM hum and noise	40 dB
Audio response	
below limiting	6 dB/oct +1, -3 dB (cf 1 kHz) 300-2550 Hz
in limiting	0 dB +0, -4 dB (cf maximum system deviation) 450-2550 Hz
above 3 kHz	-35 dB/oct min
input for 60% deviation	5 mV
distortion	<5% at 1 kHz
Ruggedness	2 minutes (into infinite SWR)
Stability	5:1 SWR (all phase angles, <-60 dBc)

Circuit descriptions

Figure B-1 shows the circuit interface diagram for the Tait Orca handportable radio.

The Tait Orca handportable has been designed to be totally electronically tuned using the *Calibration System for Tait Orca Radios*. The titles in parentheses below refer to tests available in the calibration system. Consult the calibration system *User's Manual* for more information on specific calibration tests.

Transmitter

The RF power amplifier amplifies transmit RF from the VCO to the output power level (4W UHF/5W VHF). The PA output is fed to the PIN switch, which provides isolation between the transmit and receive paths.

A LPF follows the PIN switch and provides attenuation of unwanted high frequency signals.

Following the LPF, the signal is fed to the antenna.

The output power level is controlled by the microprocessor and associated circuitry, and is initially set by calibrating the radio (**Power Level** test).

Transmit (Tx) audio

Tx audio from the microphone is processed into two modulation signals, one required by the TCXO in the synthesiser and the other by the VCO.

A digital pot is used to set the overall deviation and modulation balance; these are controlled by calibration (**Maximum Deviation** and **Modulation Balance** tests).

Receiver

RF from the antenna is fed via the LPF and PIN switch into the receiver. The RF passes through the front end tuning circuit, which selects the desired frequency. The front end is tuned during calibration (**Front End Tuning** test).

The output of the front end tuning stage is fed to the first mixer, and the VCO provides the local oscillator input. The output of the mixer is at the first IF frequency (45.1 MHz UHF/ 21.4 MHz VHF).

The IF signal passes through a crystal filter and onto the IF amplifier. From there it goes through a second crystal filter and into the Demod IC.

In the Demod IC, the first IF passes through the second mixer, producing the second IF (455 kHz). The second IF passes through a band pass filter and IF amp, which are external to the IC. The second IF is then fed back into the Demod IC for another amplification stage, then through another external band bass filter. The final stage is the phase lock loop (PLL) discriminator in the Demod IC, which produces detected audio.

A squelch detect circuit uses high frequency audio noise to control the threshold at which the radio mutes and unmutes. This threshold is set up by the microprocessor and can be set during calibration (**Squelch Thresholds** test).

The RSSI output of the detector circuit provides an analogue indication of the received signal strength. RSSI thresholds are set during calibration (**RSSI Thresholds** test).

The receiver can operate on wide/medium or narrow band (TOP-x2xxx radios), or wide or medium band (TOP-x1xxx radios), which is programmable on a per channel basis.

Receive (Rx) audio

The received audio is processed by the DSP, amplified and fed to either an internal or external speaker, whose selection is controlled by a line from the microprocessor.

Unprocessed audio from the output of the Demod IC (RX-DET-AUDIO) is available at the accessory connector.

All signalling, such as Selcall, CTCSS, DCS, DTMF and FFSK, and all confidence tones are generated by the DSP.

Synthesiser and VCO

The synthesiser receives channel frequency information from the microprocessor. It then sets the VCO to the required frequency and maintains its stability using a phase-locked loop. There are two VCOs, one for the receiver and one for the transmitter (one or two? depends on radio type?).

An output from the synthesiser (Lock Detect) indicates whether the VCO is producing the correct frequency (the radio is in lock). If the frequency is incorrect, the Lock Detect status prevents the transmitter from operating.

The reference frequency for the synthesiser is provided by the TCXO (temperature compensated crystal oscillator), which is initially set on frequency using a DC voltage at calibration (**TCXO Calibration** test).

Power supplies

+5V Dig

The +5V Dig supply provides regulated 5 V to the microprocessor and its associated circuitry. It is controlled by the on/off switch and a line from the microprocessor.

It provides 5 V to all circuitry that requires power when the radio is in economy mode.

+5V AN

The +5V AN supply provides the power to all circuitry that requires 5 V when the radio is not in economy mode. It is controlled by a line from the microprocessor and is a regulated supply.

+5V TX

The +5V TX supply provides power for the exciter stage of the transmitter when the radio is in transmit mode. It is controlled by a line from the microprocessor and is a regulated supply.

+7.5V-BATT

The +7.5V-BATT supply is the unregulated voltage supplied to the radio from the battery.

+7.5V-ACC

The +7.5V-ACC supply is supplied to the accessory connector from the battery through a switch and some current limiting.

+7.5V

The +7.5V switched supply is unregulated voltage supplied to the radio from the battery through a switch.

+14V

The +14V switch mode supply provides the 14 V required by the loop filter in the synthesiser.

A 14V regulator derives this voltage from the +7.5V switched and +5V An supplies.

+4.3V-DEC

The +4.3V-DEC supply is derived from the +5V An voltage. It is used to switch between the transmit and receive VCOs in conjunction with the transmit command line from the processor. It also provides bias for the integrator IC in the synthesiser.

Accessory connector interface

The accessory connector interface is described in Part F: Interfacing non-Tait accessories.

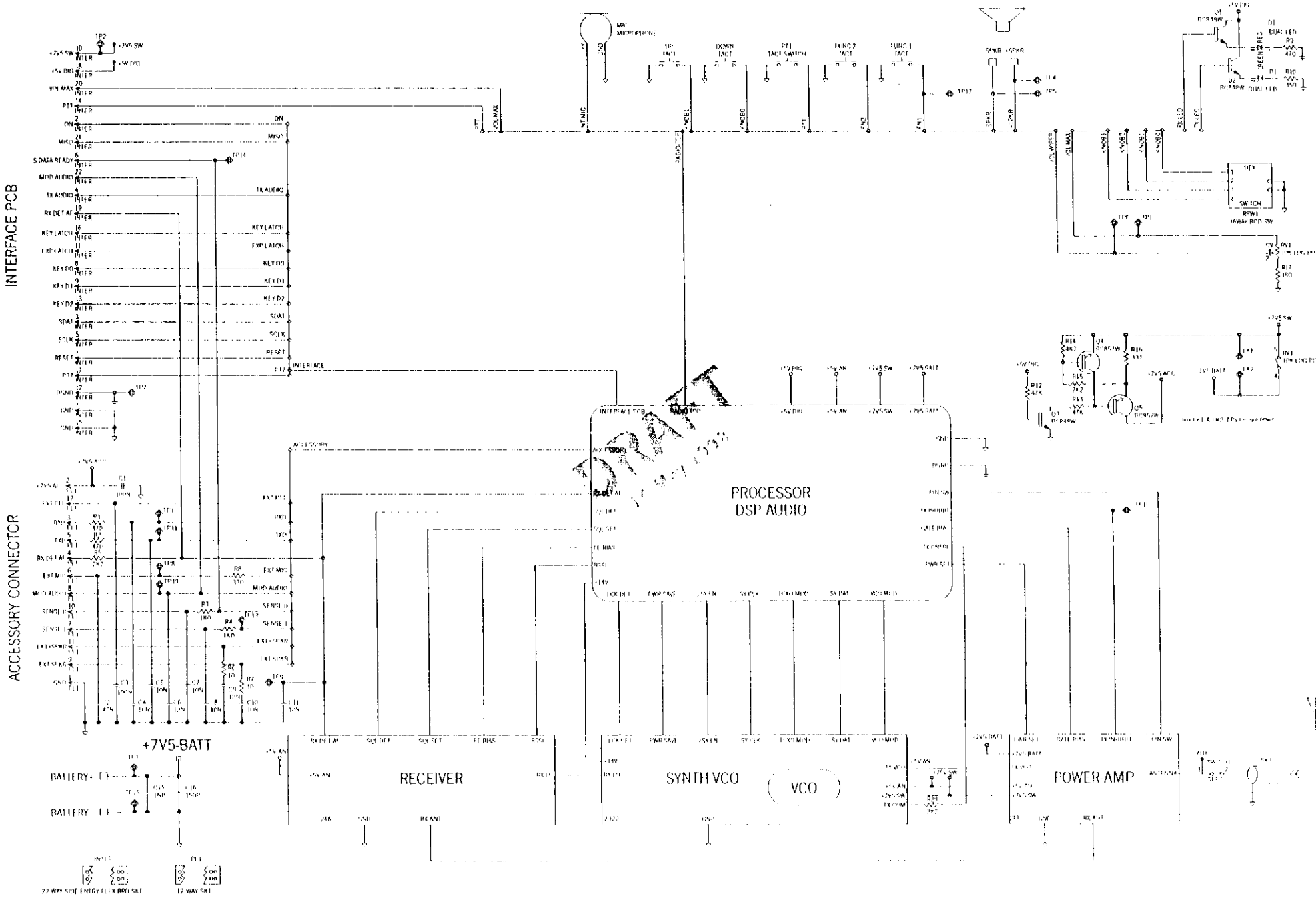

Figure B-1: Circuit interface diagram for Tait Orca handportable radios.

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Implications of narrowband versus wideband IF filtering

The two physical variants of bandwidth in the Tait Orca handportable series differ in the bandwidth of the second IF ceramic filtering, and in the squelch circuit design. TOP-x211x radios are narrowband and TOP-x111x radios are wideband.

The effect of the wider IF filtering is to allow a higher modulation depth and rate without causing either waveform or group delay distortion problems. This may be critical in high speed data reception applications, but it is recommended that this is confirmed for the actual application.

The difference in the squelch design is to work correctly with the different characteristics of the signal produced by the different IF filtering. At the same time, the squelch circuitry for the 20/25 kHz variant does not have to cope with a large range in the modulation depth, and hence can be optimised for ideal performance. The 12.5/ 20/25 kHz variant has the compromise that high deviation signals can 'desensitise' the receiver, in that they confuse the squelch circuitry and may cause occasional chopping of the audio in fringe areas. Performance may also be impaired at temperature extremes for high deviation signals through the 12.5/20/ 25 kHz variant, in that below -20°C and above +55°C, squelch may not operate properly.

PART C Diagnostics and fault finding

Contents

Diagnostics and fault finding

This section provides information on diagnosing faults in Tait Orca handportable radios.

The information in the fault finding charts should be used in combination with the test facilities, and it may also be helpful to examine the radio programming software data using the programming system for Tait Orca conventional or trunked radios.

Test facilities

Standard test facilities provide a way of testing the radio's functions independently of normal radio operation. A series of test commands can be sent to a radio in two ways:

- using the calibration system; or
- using a terminal program

See the *User's Manual: Calibration System for Tait Orca Radios* for information on using the calibration system to send test commands to a radio.

When using a terminal program, use the following settings:

- baud rate: 9600
- number of data bits: 8
- number of stop bits: 1
- parity: none
- flow control: xon/xoff.

To put the radio into computer-controlled test mode, send **^ (Shift-6)**, wait for a return prompt, then send **% (Shift-5)**. You can then begin sending test commands to the radio.

A full list of test commands is given in Table C-1. Table C-2 shows how to calculate the parameters necessary for test command 101. If using the calibration system to send test commands to a radio, the parameters for command 101 are automatically calculated.

Error codes

The errors you may receive while the radio is in test mode are:

- {C01} An invalid command code has been received.
- {C02} A (valid) command code has been received but had invalid parameters.
- {C03} A (valid) command code has been received but it cannot be processed at this time.
- {C04} An error occurred during the initialisation of test mode.
- {X04} Front panel test failed. Indicates that a power-on front panel test has failed.
- {X05} MCU internal configuration incorrect. Indicates that MCU's internal configuration is incorrect and the radio is in the wrong operating mode. The radio must be switched off and on again in a mode that allows it to be programmed.
- {X06} MCU internal configuration now programmed. Indicates that the microprocessor's internal configuration has now been set correctly, but the radio must be switched off and on again for the change to take effect.
- {X07} MCU operating mode error. Indicates that the microprocessor has powered up in a mode that provides inadequate security for its internal configuration.
- {X08} Test link error. Indicates that a valid reply to the logon prompt has been received with the test link still connected.

- (X31) ESN checksum error. Indicates that the radio's ESN checksum is incorrect.
- (X32) Database checksum error. Indicates that the radio's database checksum is incorrect.
- (X35) Temperature >T1 threshold; impending turn down of transmit power.
- (X36) Temperature >T2 threshold; impending turn off of transmitter..
- (X37) Voltage <V1 threshold; low battery warning.
- (X38) Voltage <V2 threshold; impending turn off of radio. The radio turns itself off after indicating this error and so will be unable to respond to the reset command character.

Fault finding charts

The fault finding charts in Figures C-1 to C-6 address the faults you are most likely to find. If you experience other faults that do not fall into these categories, contact your Tait dealer.

Table C-1: Test commands

Function	Description	CCTM code	Parameters
Signaling	Set modem to send zeros	10	None
	Set modem to send ones	11	None
	Set modem to send preamble	12	None
	Read modem receive string (continuous)	14	None
	Disable all signalling	15	None
	Enable subaudible signalling	16	None
	Read subaudible signalling decode status	17	Returns: 0 = signal not detected, 1 = signal detected
Mute	Force Rx audio muted	20	None
	Force Rx audio unmuted	21	None
	Mute DSP input	22	None
	Unmute DSP input	23	None
	Let squelch control Rx audio	24	None
	Read RX_BUSY status	25	Returns: 0 = busy inactive, 1 = busy active
	Relax Rx mute control	26	None
Rx/Tx	Inhibit PA (transmit mode)	30	None
	Enable PA (transmit mode)	31	None
	Set radio to Rx	32	None
	Set radio to Tx	33	None
	Set transmit to low power	34	None
	Set transmit to mid power	135	None
	Set transmit to high power	35	None
	Set transmit to max power	36	None
	Set transmit to no power	137	None
	Activate economy mode	42	None
	Deactivate economy mode	43	None
	Read battery level	46	Returns: 0 to 255
	Read temperature level	47	Returns: 0 to 255
	Set keypad test on	50	None
	Set keypad test off	51	None
	Set display test on	52	None
	Set display test off	53	None
	Set L1 threshold	61	0 to 255
	Set L2 threshold	62	0 to 255
	Read averaged RSSI level	63	Returns: 0 to 255
	Read L1 threshold	64	Returns: 0 to 255
	Read L2 threshold	65	Returns: 0 to 255
Miscellaneous	Select normal micro clock	70	None
	Select divide micro clock	71	None
	Read synth lock status	72	Returns: 0 = not in lock, 1 = in lock
	Select external speaker/microphone	74	
	Select internal speaker/microphone	75	
	Stop the MCU clock	79	None
	Select wide band	84	None
	Select medium band	85	None
	Select narrow band	86	None
	Select CTV squelch	88	None
	Select PC/DTV squelch	89	None

(continued on next page)

Table C-1: Test commands (continued)

Function	Description	CCTM code	Parameters
Radio info	Read radio serial number	94/131	Returns: 6 digit number
	Read DSP software version number	132	Returns: 4 digit number (hex)
	Read radio software version number	96	Returns: 4 digit number
	Read radio type	130	Returns: frequency band (B-J), channel spacing (1 or 2)
Synth	Load absolute synth frequency	101	ttttt T rrrrrr R F (see Table x+1)
	Load synth reference divider	102	8 to 16383
Config	Set volume pot	110	0 to 255
	Set transistor gate bias	111	0 to 255
	Set TCXO mod	112	0 to 255
	Set VCO mod	113	0 to 255
	Set Tx power level	114	0 to 255
	Set TCXO coarse frequency	115	0 to 255
	Set TCXO fine frequency	116	0 to 255
	Set Rx front end tuning	117	0 to 255
	Set squelch threshold	118	0 to 255
	Set CTCSS modulation	120	0 to 32767
	Set DCS modulation	121	0 to 32767
	Set FFSK modulation	122	0 to 32767
	Set Selcall modulation	123	0 to 32767
	Set DTMF modulation	124	0 to 32767
	Set voice modulation	125	0 to 32767
	Force DCS signalling (023 tone)	126	None
	Force CTCSS signalling (670 Hz)	127	None
	Force Selcall signalling (2000 Hz for 2 seconds)	128	None
	Force DTMF signalling (tone A)	129	iN: 1 = start encoding, 0 = stop encoding
	Read calibrated volume setting	136	Returns: 0 to 255

Table C-2: Calculating the parameters required for test command 101

Calculating parameters for test command 101

Enter the parameters in the format ttttttT rrrrrrR F

- ttttttrepresents the transmit frequency
  See Example 1
- T and R represent channel spacing
  0 = 5 kHz
  1 = 6.25 kHz
- rrrrrr represents the receive frequency
  See Example 2
- F indicates whether the test command changes the calibration values
  0 = do not change calibrated values
  1 = recalculate calibrated values based on new frequencies

Note: tttttt and rrrrrr may be up to 6 digits long.

Example 1: Calculating tttttt for an H band radio

$$\text{tttttt} = \frac{\text{transmit frequency (MHz)}}{\text{channel spacing (MHz)}}$$

$$= \frac{461.025\ \text{MHz}}{6.25\ \text{kHz}}$$

$$= \frac{461.025 \times 10^6\ \text{Hz}}{6.25 \times 10^3\ \text{Hz}}$$

$$= 73764$$

Example 2: Calculating rrrrrr for an H band radio

$$\text{rrrrrr} = \frac{\text{receive frequency (MHz)} - \text{IF (MHz)}}{\text{channel spacing (MHz)}}$$

$$= \frac{461.025\ \text{MHz} - 45.1\ \text{MHz}}{6.25\ \text{kHz}}$$

$$= \frac{415.925 \times 10^6\ \text{Hz}}{6.25 \times 10^3\ \text{Hz}}$$

$$= 66548$$

Note: IF depends on the radio's switching band.

- For B, C and D bands radios, the IF is 21.4 MHz.
- For E, F, G, H and I band radios, the IF is 45.1 MHz.
- For J band radios, the IF is 70.1 MHz.

Figure C-1: Fault finding – Radio cannot be switched on

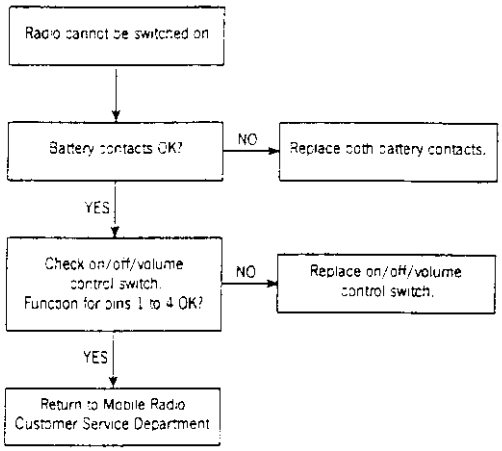
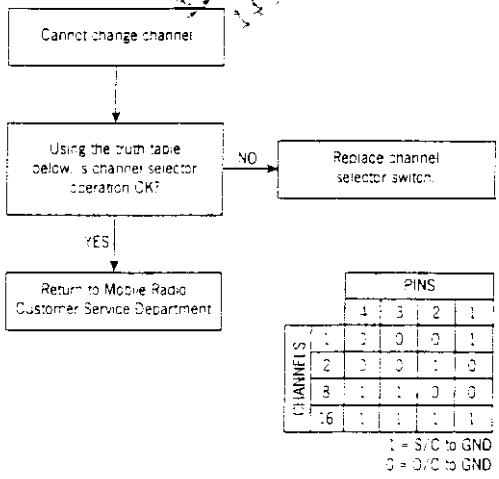


Figure C-2: Fault-finding – Cannot change channel



CHANNELS	PINS 4	3	2	1
1	1	0	0	1
2	1	0	1	0
3	1	1	0	0
16	1	1	1	1

1 = S/C to GND
0 = O/C to GND

Figure C-3: Fault finding – No serial communications

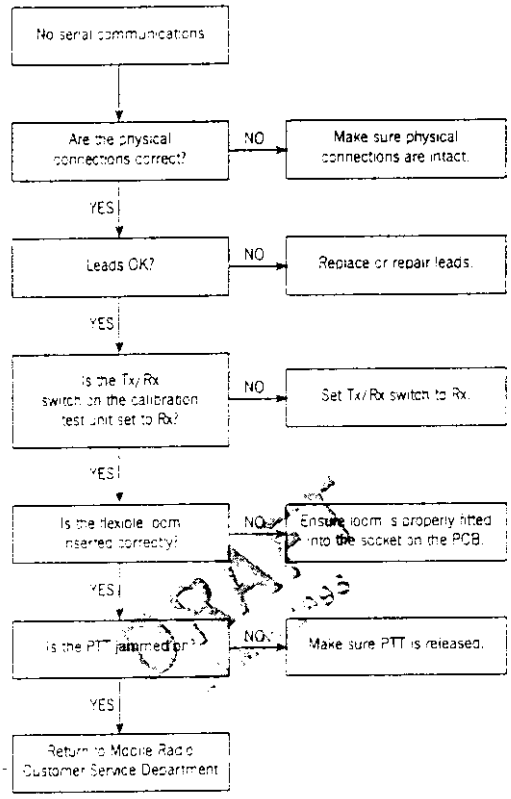


Figure C-4: Fault finding – Receive faults

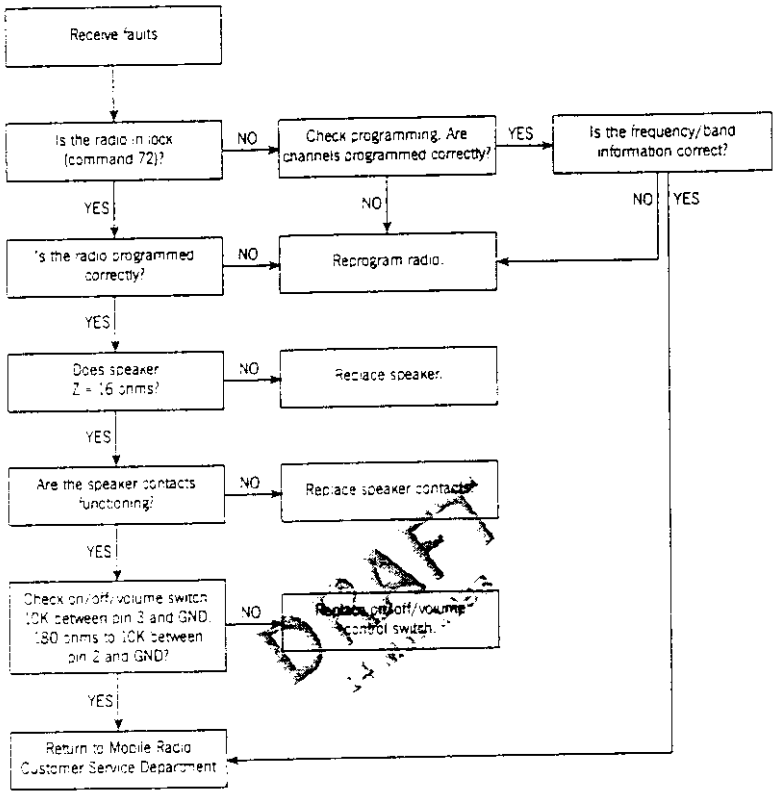


Figure C-5: Fault finding – Cannot transmit

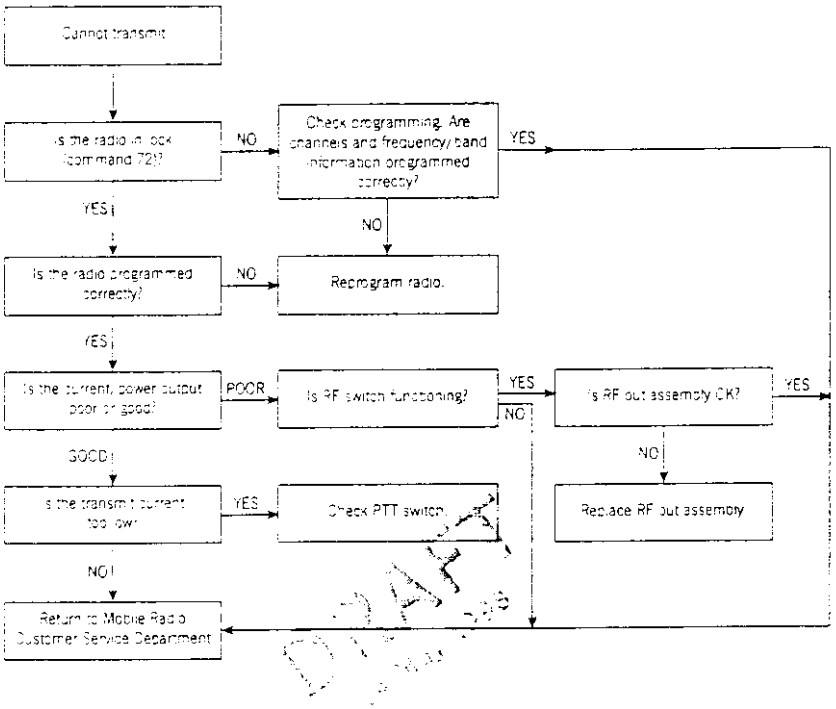
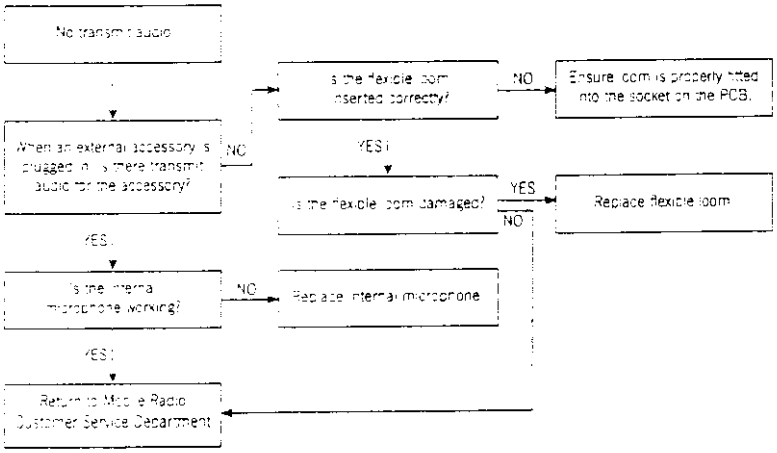


Figure C-6: Fault finding – No transmit audio



PART D Servicing the radio

Contents

Servicing the radio

This chapter describes the disassembly and reassembly of your Tait Orca handportable radio, and the servicing of some key mechanical and ancillary devices. These are:

- PTT keypad
- speaker
- antenna connector
- channel selector switch
- volume control switch
- microphone
- speaker contacts
- battery contacts
- PTT tact switch
- auxiliary flex
- RF out assembly.

A list of spares for your Tait Orca handportable is shown in Table D-1, together with the devices they are required for. These spares can be ordered from your local Tait dealer.

Table D-1: Spares for Tait Orca handportable radios

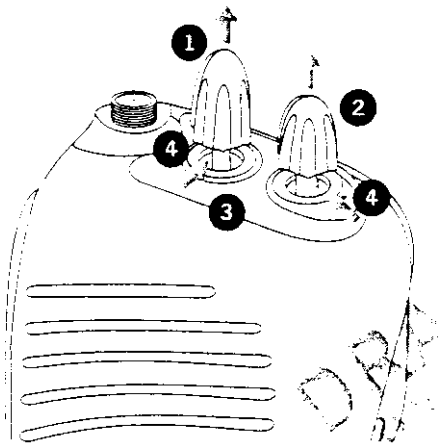
IPN Number	Description	Device replacing*
040-05500-03	Volume control switch	Volume control switch
231-00010-45	Channel selector switch	Channel selector switch
311-01043-00	Volume control knob	All (excl. PTT keypad)
311-01044-00	Channel selector knob	All (excl. PTT keypad)
303-30071-00	Battery catch	Battery pack
303-50087-00	Belt clip	Battery pack
308-01057-00	Aux dummy rear cover	Auxiliary flex
240-02100-55	SMA connector	Antenna connector
252-00010-56	Microphone	Microphone
303-11194-00	Handportable chassis	If damaged
319-01203-00	Main RF shield	If damaged
232-00020-29	PTT tact switch	PTT tact switch
356-01074-00	Battery contact probe	Battery contacts
352-00010-52	Channel/volume control nut (M6*7.9*3 mm)	Channel selector switch Volume control switch
352-00010-53	SMA connector nut (1/4*7.9*3 mm)	Antenna connector
353-00010-42	Ribbed lock washer 3 (M6*10*0.7 mm)	Antenna connector Channel selector switch Volume control switch
362-01087-00	Battery contact seal	Battery contacts
360-02015-00	Microphone grommet/seal	Microphone
362-01088-00	Rear panel seal	Auxiliary flex
362-01089-00	Auxiliary flex seal	Auxiliary flex
362-01092-00	Main seal	All (excl. PTT keypad)
362-01091-00	Knob seal	All (excl. PTT keypad)
252-00010-55	Speaker (0.5W 16E Foster)	Speaker
302-05231-00	Speaker mounting bracket	Speaker
307-01021-00	Speaker cloth	Speaker
369-01039-00	Speaker adhesive ring	Speaker
OPF100	Front panel **Complete** - Black (316-06629-00 bare)	
316-06632-00	Rear panel	If damaged
316-06634-00	Front panel logo plate	If damaged
311-03099-00	PTT keypad	PTT keypad
316-85124-00	PTT retaining plate	PTT keypad
360-01060-00	PTT/function key actuator	PTT keypad
345-00020-00	PA screw (M2*5 mm Pan Pozi)	All
345-00020-01	Chassis screw (M2*8 mm Pan Pozi)	All
349-00030-00	Speaker screw (1.8*5 mm Torx)	Speaker
220-01414-00	Aux flex connector PCB	Auxiliary flex
219-50029-00	RF OUT assembly	RF out assembly

*Note that not all parts will need to be replaced when a given device is replaced.

Removing the front panel from the chassis

Unscrew the antenna and detach the battery pack. Remove the knobs by inserting a side cutter flat side down at the base of each knob (Figure D-1), making sure not to damage the knob label and the switch shaft. Squeeze lightly; the knobs should pop off. Discard the knobs.

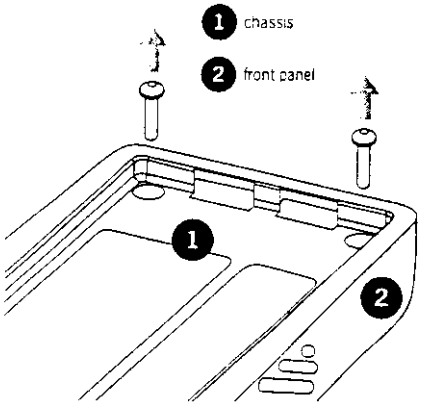
Figure D-1: Removing the knobs



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

Using a Torx T6 driver, remove the two screws at the base of the radio (Figure D-2). 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).

Figure D-2: Removing the screws at the base of the radio



Note that the PTT keypad should be removed once the front panel has been removed from the chassis if you wish to avoid damaging the front panel.

Removing the chassis from the shield

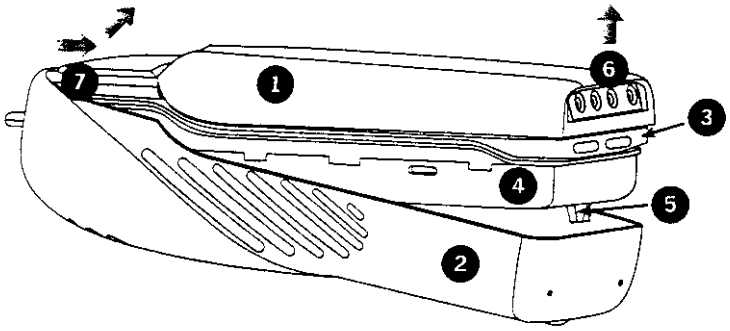
To remove the shield, place the radio on a flat surface with the shield side facing up toward you. Press lightly down on the shield above the slot clip detail (Figure D-4), which will slightly bow the shield away from the chassis. Maintain pressure and insert a bladed screwdriver (approx. 4 mm) in the gap between the shield and the chassis. Twist the screwdriver and the shield should rise up over the clip. Repeat this on the other side. Remove the microphone grommet and put it in a safe place.

You can now see the bottom surface of the PCB. The basic layout of the PCB is shown in Figures 15 and 16. Refer to these diagrams for the placement of parts.

At this point you can replace:

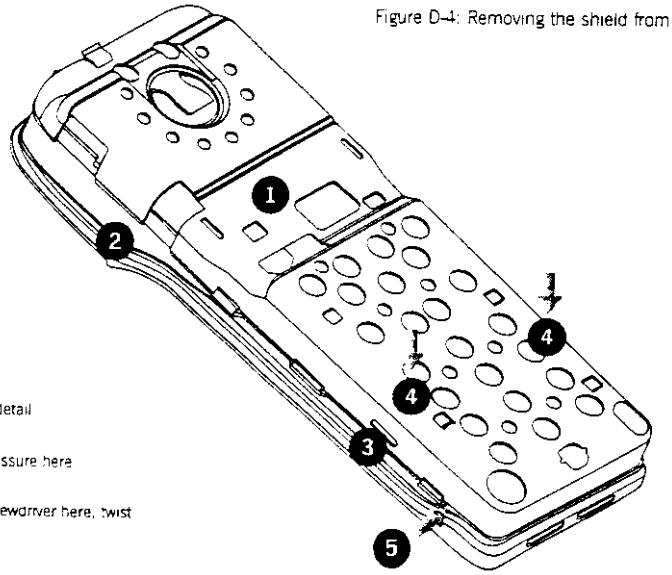
- the PTT keypad (page D-5); and
- the speaker (page D-5).

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



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

Figure D-4: Removing the shield from the chassis



1. shield
2. chassis
3. slot clip detail
4. apply pressure here
5. insert screwdriver here, twist

Removing the PCB from the chassis

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

Use a Pozi 1 driver to remove the screw through the PA shield. Remove the three nuts for the antenna connector and knobs using an 8 mm long reach socket driver set to 10 inch pounds, 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 antenna connector (page D-8);
- the channel selector switch (page D-8);
- the volume control switch (page D-8);
- the microphone (page D-8);
- the speaker contacts (page D-8);
- the battery contacts (page D-8); and
- the PTT tact switch (page D-9).

Once the required devices have been replaced, refer to the reassembly instructions on pages D-9 to D-11. Since replacement of the antenna connector and/or the channel selector and volume control switches requires that the PCB must be replaced on the chassis, the instructions for replacing these is included as part of the reassembly instructions.

Replacing the PTT keypad

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

To remove the PTT keypad, from the inside of the front panel, gently push the five latches that hold the keypad in place.

To replace the PTT keypad, fit the seal to the keypad, if necessary, making sure not to split or otherwise damage it. Place the three latches on the long edge of the keypad into place, then make sure the pins on the function keys and PTT key fit into the holes on the front panel. Clip the keypad into place.

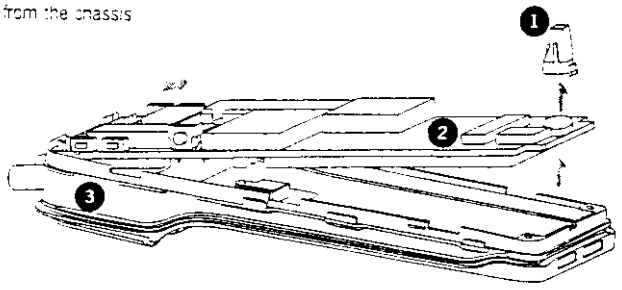
Replacing the speaker

Following the disassembly instructions, remove the front panel from the chassis. The speakers sits in the mounting bracket on the inside of the front panel (see Figure D-8).

Use a Torx head No. 6 screwdriver to remove the two screws at the base of the mounting bracket. Lift the speaker and mounting bracket out and discard.

Insert the new speaker and mounting bracket in the front panel, making sure the top edge of the mounting bracket goes under the lip in the front panel (Figure D-8). Replace the two screws to secure the speaker in place.

Figure D-5: Removing the PCB from the chassis



1 microphone grommet
2 PCB
3 chassis

Figure D-6: Bottom surface of PCB, which is visible when the shield has been removed from the chassis

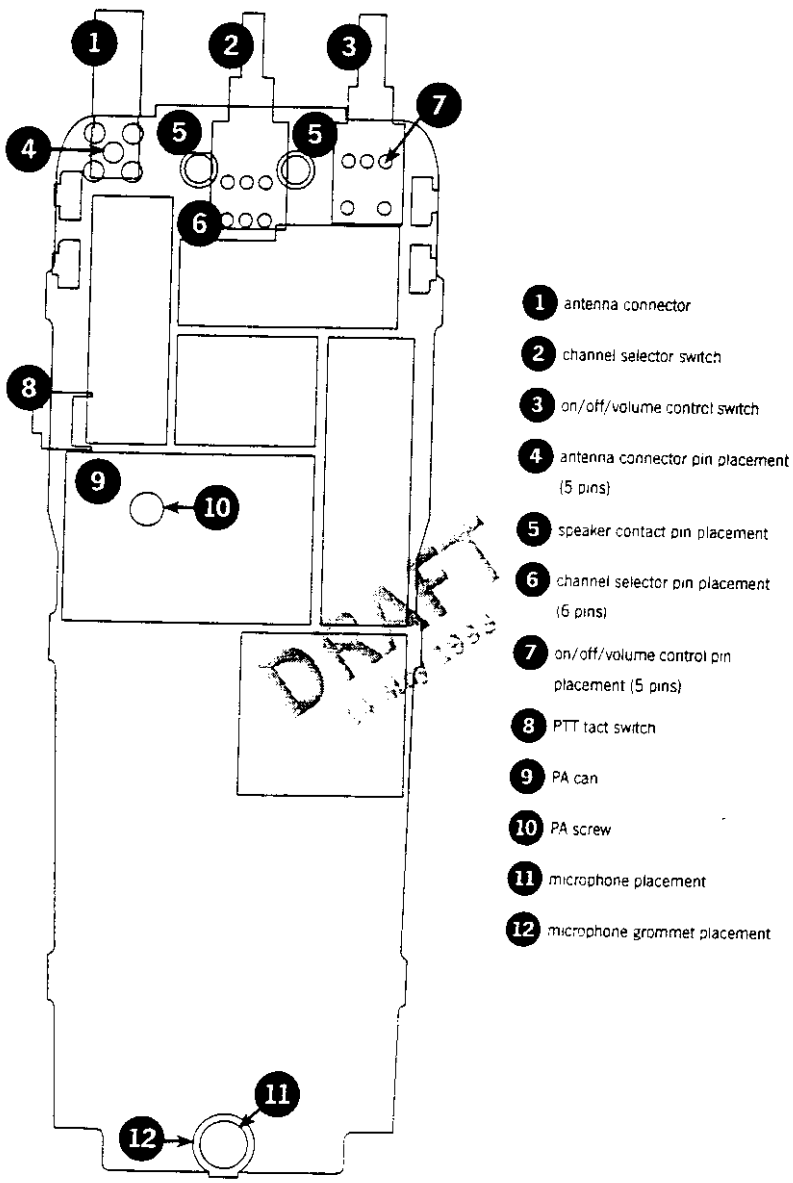
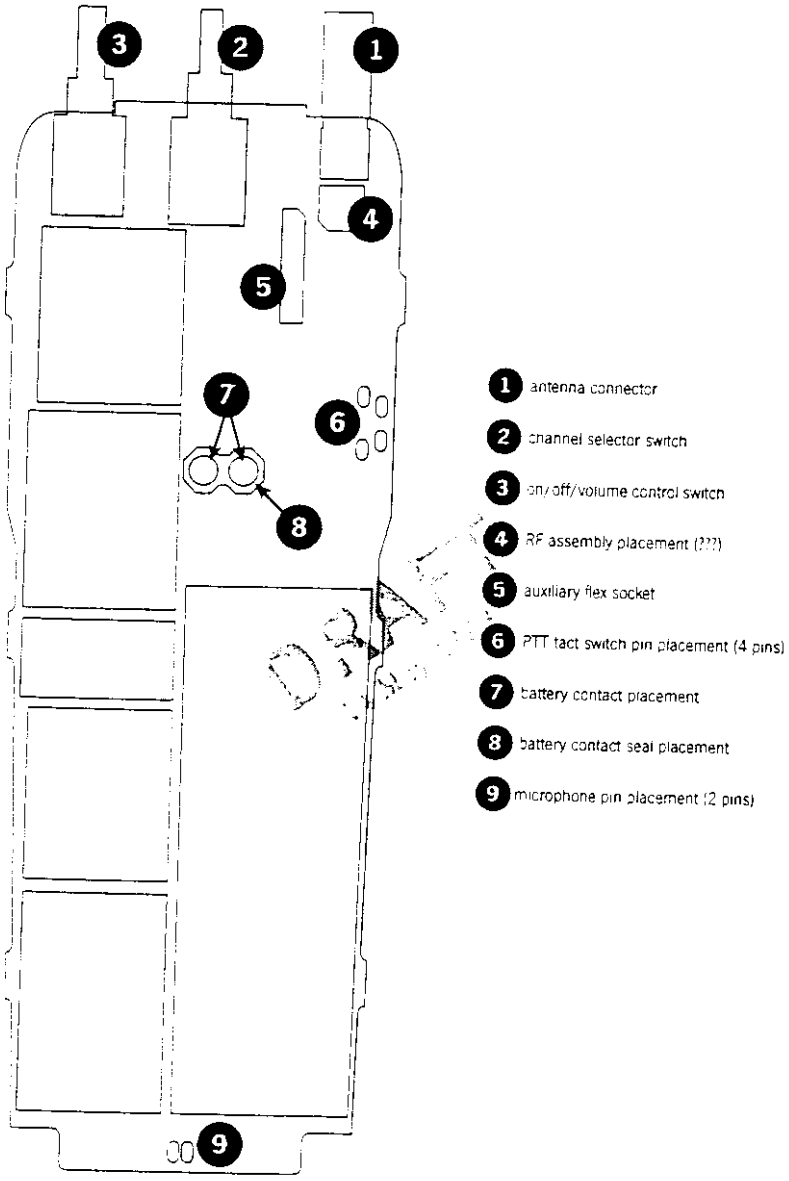


Figure D-7: Top surface of PCB, which is visible only when the PCB has been removed from the chassis



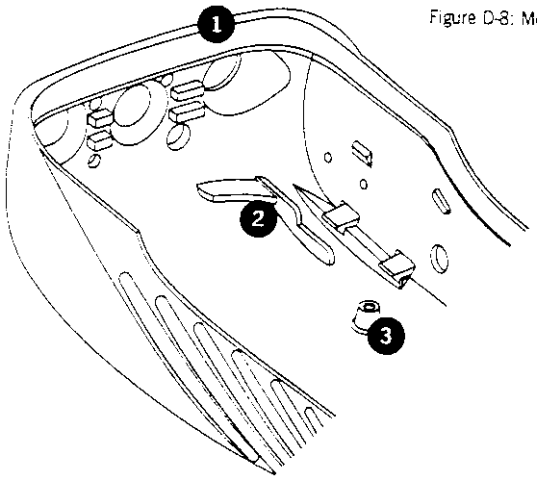


Figure D-8: Mounting the speaker in the front panel

1 front panel

2 speaker mounting bracket sits under this lip

3 speaker mount

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-9 to D-11.

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-6 and D-7 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 xxxxx tip).

Replacing the battery and speaker pins

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 pins, replace the other pin, even if only one is faulty. If available, use solder paste to replace the pins.

Remove the pin with a soldering iron and discard the pin. Refer to Figures 15 and 16 for the placement of the battery contacts and speaker pins.

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

Replacing the PTT 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 15 and 16 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).

Replacing the auxiliary flex

Should you need to replace the auxiliary flex, you will first need to remove the PCB from the chassis. Following the disassembly instructions, dissassemble the radio to the PCB level, then remove the rear panel, as described below.

Removing the rear panel

Refer to Figure D-9 for the details of the rear panel assembly.

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 auxiliary flex seal. Using a calibrated pin, lift out the rigidiser from the lower lefthand corner. Remove the rigidiser and the seal from the chassis; they should come out as a unit.

Replace the auxiliary flex if it is faulty.

Rear panel reassembly

Insert the end of the rigidiser in the slot in the seal and make sure it is properly lined up (Figure D-9). Push the seal and rigidiser firmly into the chassis aligning the notch in the seal with the locating pin on the chassis. The rubber must sit flush with the back of the chassis or the back panel will not sit properly and the battery will not fit on. On the front of the chassis, use a pin to make sure the four notches on the seal (Figure D-9) sit on the edge of the chassis.

Fit the rigidiser in the chassis; you should feel it snap into place.

Replace the seal by tucking the two notches at the top of the seal under the lip on the chassis and placing it over the rigidiser. Make sure the seal is flush with the chassis.

Slide the rear panel on from the top of the radio (Figure D-9). Force it into place by pressing the top edge of the cover against the edge of a table. Make sure the gap between the cover and the chassis is as small as possible.

Reassembling the radio

This section describes the reassembly of the radio once the required units have been serviced.

Fitting the PCB to the chassis

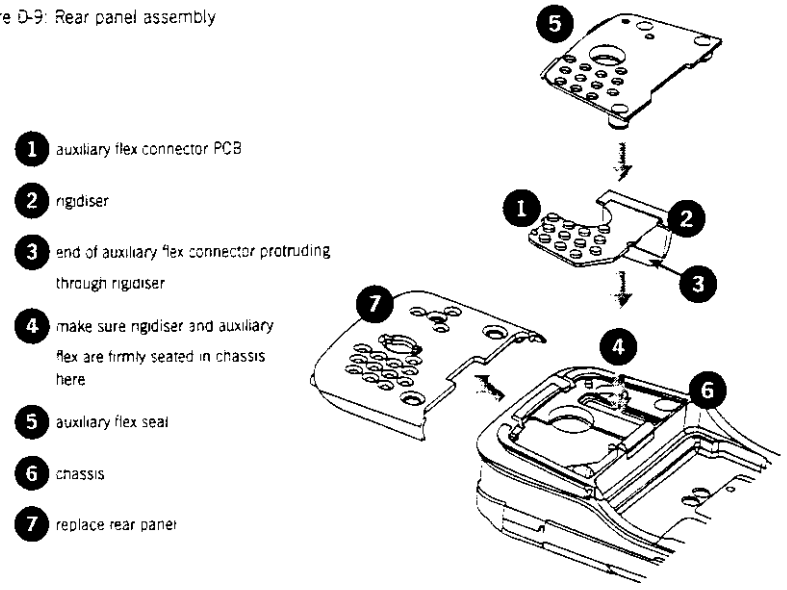
Put the battery contact seal on the battery contacts rather than on the chassis. If you put the seal on the chassis, the contacts will squash the seal.

Make sure the RF out assembly is fitted properly (see Figure D-10).

If you have removed the antenna connector or either of the switches, fit them on the PCB (refer to Figures 15 and 16) 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 centered, referring to Figures 15 and 16 for placement. Figure D-11 shows the reassembly of the antenna and switches. Replace the washers, making sure the cone faces up. Replace the nuts, making sure they are threaded correctly before using an 8 mm long reach socket driver set to 10 inch pounds. The nuts for the two switches are black. Then tighten the PA screw using a Pozi 1 driver set to 2 inch pounds.

Figure D-9: Rear panel assembly



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.

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 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.

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

Fitting the front panel to the chassis

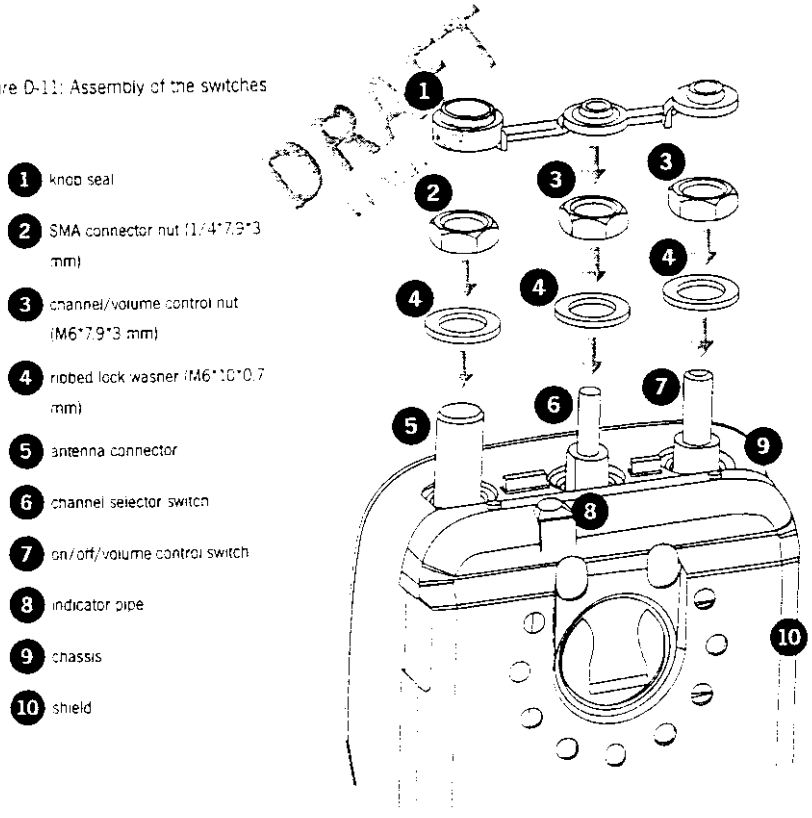
Place the radio into the front panel top first, inserting the antenna connector and knob switches through the holes. Gently ease the radio into the front panel until the edge of the chassis is flush with the edge of the front panel, while making sure that the seal isn't pinched. Replace the two screws at the base of the radio using a 3 inch pounds Torx head screwdriver.

Replace the two knobs with new knobs. Make sure there is no gap between the base of each knob and the knob label by firmly pressing

Figure D-10: RF out assembly

the top of each knob against a firm surface. Choose a surface that will not damage the top of the knob.

Figure D-11: Assembly of the switches



PART E

Downloading radio software

Contents

Downloading radio software

The <thingee> program can be used to download radio software from your PC to a Tait Orca series radio.

The <thingee> requires:

- an IBM compatible PC with an 80386 microprocessor (or better);
- MS-DOS version 5.0 or higher;
- 2 MB of RAM;
- a VGA colour graphics display;
- a hard disk drive with 2 MB (how much??) free space;
- a single 3.5 inch floppy disk drive (1.44 MB capacity); and
- a Microsoft or compatible mouse and driver (if you wish to use the program with a mouse).

The <thingee> cannot be used to download software to Tait T2000 or T3000 series radios.

Installing the software

The <thingee> cannot be run directly from the distribution disk, and so must be installed on your hard disk.

Insert the supplied disk in the floppy drive and at the DOS prompt, type **a:install** (if the disk is in drive A) or **b:install** (if the disk is in drive B). Press **Enter**. The installation program will guide you through the installation process. Read the information presented on the screen carefully. After installing the software, place the original distribution disk in a safe place.

Drive and path options

You will be asked to enter the drive and path to which you want the software installed. If you do not change the default directory, then the files will be placed in the \ORCA\XXX directory on the target drive. It is highly recommended you use the default directory setting, especially if you have already installed or intend to install other Tait programming and support software packages.

Installing a mouse

To use this program with a mouse, your mouse driver software must be loaded. Usually a command such as c:\<pathname>**\mouse.exe** can be added to your AUTOEXEC.BAT file to load the mouse driver automatically when your computer starts up. See the instruction manual for your mouse software for more details.

If a mouse is connected to a serial port on your computer, you must have a second serial port available to connect to the radio you wish to read or program. You can select which serial port is used to communicate with the radio in the **Setup Communications** window (**Setup** menu).

Setting up a program item (Windows 3.x) or shortcut (Windows 95)

If you wish to set up a Windows 3.x program item or Windows 95 shortcut for easier access to the <thingee> see pages 5 to 6 of the *User's Manual: Calibration System for Tait Orca Radios*, which is supplied as part of the service kit.

Connecting a radio

The service kit contains the leads necessary for connecting the radio to be programmed to your PC. Your radio should be turned off before you connect it to the computer.

Connect the radio as follows.

- For mobile radios, connect the programming cable to the radio using the telephone-style plug and to the compu-

ter's serial port using the serial connector. The programming lead is not required.

- For handportable radios, connect the programming cable to the programming lead, then connect the accessory connector to the radio and the serial connector to the computer's serial port.

The serial connector is 25-pin; if your computer has a 9-pin serial port, you will need an adaptor cable. This is available from your PC dealer.

Once connected, the radio must be turned on before it can be programmed. The battery should be fully charged or a DC service adaptor used to ensure that the radio does not turn itself off during the programming session.

Using the <thingee>

The <thingee> can be run from DOS, from Windows 3.x or from Windows 95.

To start the <thingee> from DOS, change to the directory the <thingee whatever it's called> was installed in, type **orcaxxxx**, then press **Enter**.

To start the <thingee> from Windows 3.x, in **Program Manager**, choose **Run** from the **File** menu. Type **c:\<pathname>\orcaxxxx**, then press **Enter**. If you have set up a program item, you can start the <thingee> by double-clicking on the program item.

In Windows 95, choose **Start** from the taskbar. Choose **Run** and type **c:\<pathname>\orcaxxxx**, then press **Enter**. If you have set up a shortcut, you can start the <thingee> by double-clicking on the shortcut.

When you first start the <thingee> a window will appear showing the version number of the software in the middle of the screen and four menus along the top. The menus are:

- use **Radio** to **Download** or **Upload** radio software;
- use **Setup** to change program properties;
- use **Help** to get general help; and
- use **Quit** to exit the program.

Select the keywords by clicking on them with the mouse, or by holding the **Alt** key and pressing the underlined letter (for example: F for **File**).

All functions can be selected from the keyboard with the keystrokes outlined in Table xx.

Whenever you finish working in a window, you will return to this main window. From the main window, you can exit the <thingee> and return to the DOS prompt or Windows.

Table E-1. Navigating through the <thingee> using keystrokes

Key	Function	Key	Function
F1	Online help for the current field. Pressing the F1 key again accesses general help.	Right arrow	Move to the right along the menu items in the menu bar.
F5	Refresh the display.	Left arrow	Move to the left along the menu items in the menu bar.
Alt	Select the window menu bar. The Alt key can be used in conjunction with a hot key (the underlined letter or number) to select a specific menu or screen item. For example, pressing Alt, F, S brings up the 'Save File' window.	Ins	Toggle insert/overtype mode. The default is insert.
		Del	Delete character right.
		Backspace	Delete character left.
Up arrow	Scroll a vertical list up or move vertically in a pop-up menu.	Enter	End edit and validate new value.
Down arrow	Scroll a vertical list down or move vertically in a pop-up menu.	Esc	Close a window.
		Tab	Move to next.
		Shift-Tab	Move to previous.

6/98 IPN: 449-51000-00

Online help

Pressing the **F1** key displays online help specific to the screen open when the key is pressed.Pressing the **F1** key again displays general help.

Setting up your system

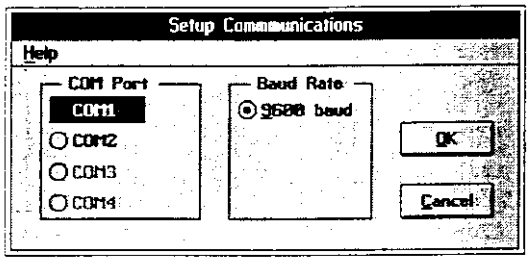
The options in the **Setup** menu allow you to change certain settings to suit your computer setup and operation. These are:

- the COM port to which the radio is attached;
- the baud rate used to communicate with the radio;
- the default directory used for downloading and uploading data files; and
- the radio memory size.

Changing COM port settings and baud rate

Select **Communications** from the **Setup** menu and the **Setup Communications** window will appear.

Figure E-1: Setup Communications window



[insert setup communications window]

COM Port shows the COM port that is used for communicating with the radio. If you have a mouse on COM1, the program will automatically detect it and assign the radio to COM2. If you wish to attach the radio to another port, choose the desired port in this screen.

Baud Rate shows the rate at which data will be copied to or from a radio. The maximum baud rate for a standard PC is 9600 baud and this is likely the only option that will appear under **Baud Rate**. However, if you have a 125k baud serial card and device driver installed on your computer, a **125k** option will appear. Select **125k** to maximise the rate of communication.

Changing the default path and <flash????>

Select **Preferences** from the **Setup** menu and the **Setup Preferences** window will appear.

[insert setup preferences window]

Data File Path shows the default directory on your hard drive that will be used for storing radio data files. If you wish to use another directory, enter the full path in **Data File Path**.

Memory Size shows the amount of memory used on radio -- can it be automatically set depending on binary file size???

Downloading radio software

Choose **Download** from the **Radio** menu and the **Download Radio Software** window will appear:

[insert download window]

Figure E-2: Setup Preferences window

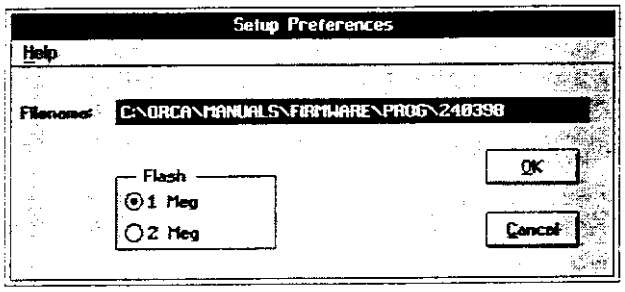
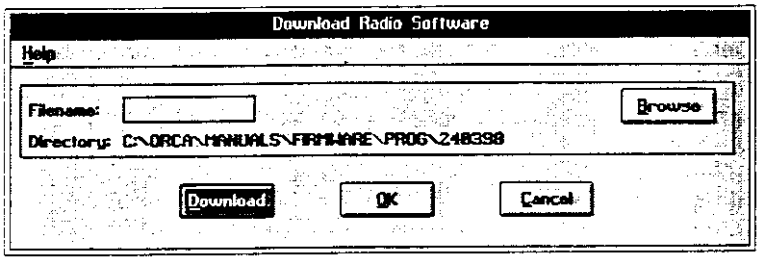


Figure E-3: Download Radio Software window



Directory shows the default directory. You can change the default directory by selecting **Preferences** from the **Setup** menu.

You can either specify the name of the file you want to open (in the **Filename** box) or search for the file by selecting **Browse**.

When you select **Browse**, the **Browse File** window appears.

The **Drives** list shows all the drives associated with your computer.

The **Directories** list shows all the directories immediately available on the selected drive. When you select a directory, the next level of directories appears. The previous level of directories is indicated by the .. symbol.

The **Files** list shows all files in the current directory with the properties shown in the **File Name** box. You can search for files using the DOS wildcards '*' and '?'. Select the file you wish to open by clicking on the filename displayed in the **Files** list, or use **Tab** to select the file name and then press **Enter**. Select **OK** to select the file and return to the **Download Radio Software** window.

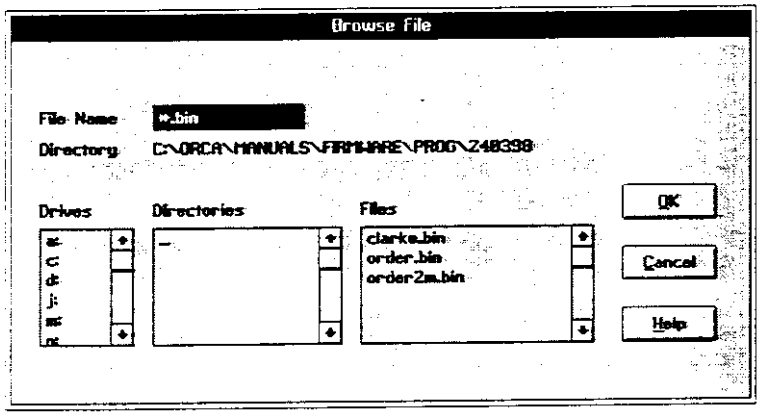
In the **Download Radio Software** window, select **Download** to begin the download process. A window will appear instructing you to ensure that the radio is turned on and connected to the computer. When you are sure that this is so, select **Start**, and the program will begin stuffing software into the radio.

[what message when finished? does radio needed to be restarted?]

Uploading radio software

[in here now because I have to do help for it]

Figure E-4: Browse File window



P/N: 449-51000-00

Choose **Upload** from the **Radio** menu and the **Upload Radio Software** window will appear:

[insert Upload window]

Directory shows the default directory. You can change the default directory by selecting **Preferences** from the **Setup** menu.

If the directory shown in **Directory** is the one you wish to copy the radio software to, you can specify the file name in the **Filename** box. If you wish to save the file in another directory, select **Browse**.

When you select **Browse**, the **Browse File** window appears.

The **Drives** list shows all the drives associated with your computer.

The **Directories** list shows all the directories immediately available on the selected drive. When you select a directory, the next level of directories appears. The previous level of directories is indicated by the .. symbol.

The **Files** list shows all files in the current directory with the properties shown in the **File Name** box. Enter the name you wish to save the file under in the **File Name** box, then select OK to return to the **Upload Radio Software** window.

In the **Upload Radio Software** window, select **Upload** to begin the upload process. A window will appear instructing you to ensure that the radio is turned on and connected to the computer. When you are sure that this is so, select **Start**, and the program will begin sucking software from the radio.

[what message when finished?]

Quitting the program

The **Quit** menu allows you to exit the programming system. A window will appear asking whether you wish to quit. Click on **Yes** or press **Enter** to return to the DOS prompt or your operating system.

PART F

Battery packs and chargers

Contents

Battery packs and chargers

Three battery packs are available for Tait Orca handportables. The battery packs are not serviceable. Information on their construction and expected life are provided below.

Three chargers are available for Tait Orca handportables:

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

The trickle charger 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 following parts:

- spring contacts;
- Skt DC jack; and
- charge/discharge tact switch.

Refer to the repair information provided below for the fast charger; this information also applies to repair of the multi-charger and the trickle charger.

The contents of the Tait Orca charger spares kit (IPN OPA-SP-202) are shown in Table F-1. Parts for 10 chargers are supplied in the kit.

Battery packs

The battery packs available for Tait Orca handportables are:

- Standard NiCd battery pack (1100 mAh);
- Heavy duty NiCd battery pack (1500 mAh); and
- High capacity NiMH battery pack (1850 mAh).

The battery casing is made of Makroblend and is ultrasonically welded. The casing is

Table F-1: Spares for Tait Orca chargers

IPN Number	Description	Chargers required for
356-01078-00	Spring contact probe	All
240-02020-07	Skt DC jack	All
232-00010-28	Tact switch	Desktop fast charger Multi-charger
308-00054-00	Charge/discharge button	Desktop fast charger Multi-charger
262-00001-00	Charger light pipe	Desktop fast charger Multi-charger
312-01069-00	Charger top	All
312-01070-00	Charger base	All
365-01549-01	Charger logo label	All
365-01522-01	Charger sticker	All
369-00010-01	Rubber charger foot	All
360-01089-00	Trickle charger blanking label	Desktop trickle charger

constructed with a planar, near field weld (<3 mm) using interference weld.

Battery life

Battery life is outlined in Table F-2. These are typical figures only, based on a UHF radio using a standard NiCd battery pack with medium economy cycling enabled.

Extending battery life

Battery life can be extended by activating economy mode. 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.

Table F-3 shows typical drain rates for economy mode. Economy mode is programmed in the **Power Save Features** screen of the *Programming System for Tait Orca Conventional Radios* or the *Programming System for Tait Orca Trunked Radios.*

Preserving battery life

- 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.

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.

Desktop fast charger

Exciting intro bit written by Ed

Operation

Table F-2: Typical battery life for a UHF radio with medium economy cycling enabled.

Duty cycle	RF power	Battery life (hours)		
		1100 mAh NiCd	1500 mAh NiCd	1850 mAh NiMH
5/5/90	Low (1 watt)	10.5	14	16
5/5/90	High (4 watts)	8	10.5	13
10/10/80	Low (1 watt)	7	9.5	11
10/10/80	High (4 watts)	4.5	6.5	8

Table F-3: Typical drain rates for a UHF radio

Mode	Supply voltage (V)	Current (mA)
Standby (no audio)	7.25	70
Economy mode (low duty cycle)	7.25	58
Economy mode (medium duty cycle)	7.25	45
Economy mode (high duty cycle)	7.25	39

Charging the battery using the fast charger

The fast charger will charge the battery when the radio is on, but the battery will charge faster if the radio is turned off. The battery can be recharged attached to the radio or as a separate unit.

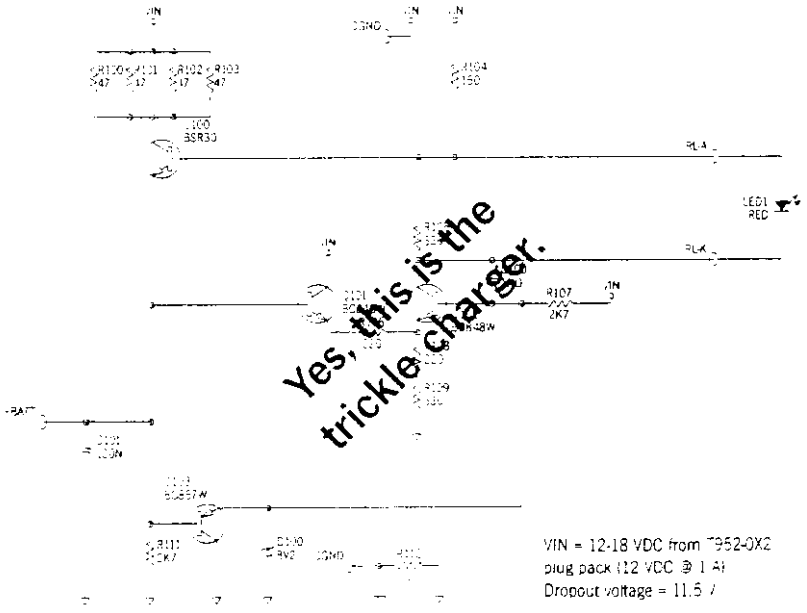
Insert the battery/radio into the charger. The indicator will glow amber for three seconds, then red. If the indicator does not glow red, make sure the battery/radio is seated properly and the charger is properly plugged in. If the battery is too hot or too cold, the indicator will remain amber until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

Charge times are:

- up to 1 1/2 hours for the standard NiCd battery;
- up to 2 hours for the heavy duty NiCd battery; and
- up to 2 1/2 hours for the NiMH battery.

Once the battery is fully charged, the indicator will change from red to green. Leaving the battery in the charger once it is fully charged does not damage the battery.

Figure F-1: Circuit diagram of the Tait Orca desktop fast charger.



Yes, this is the trickle charger.

Fast charger indicators

Fast charger indicators are described in Table 10.

Table 10: 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 being discharged
flashing amber	battery below optimum capacity

Conditioning the battery with the fast charger

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

To condition the battery, turn off the radio. Insert the battery/radio into the fast charger then press the discharge button until the indicator flashes green. The indicator will flash green while the battery is being discharged. Once the battery is discharged, it will charge normally.

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 green. When the indicator flashes green, 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 amber 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 F-2.

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, taking care not to break the notches that hold the front of the base to the body of the charger. Lift out the PCB.

repair/fault-finding info

Repair battery contacts, tact switch, DC jack if necessary.

- spring contacts;
- Skt DC jack; and
- charge/discharge tact switch.

Reassembling the charger

Refer to Figure F-2.

Hold the body of the charger upside down and insert the charge/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 in place.

Desktop trickle charger

The Tait Orca desktop trickle charger can charge a standard or heavy duty 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

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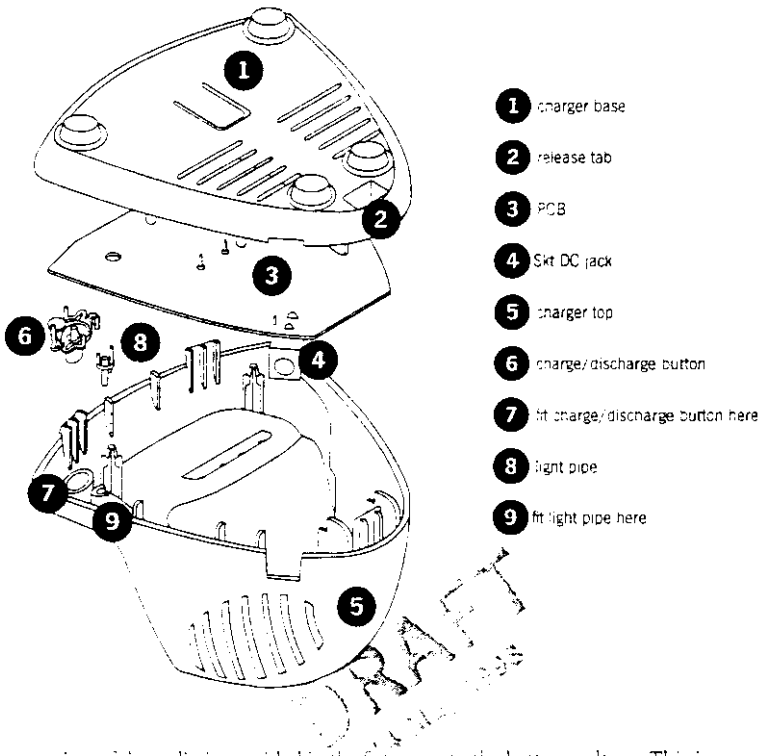
Figure F-2. Assembly of the desktop fast charger



protection of the radio is provided in the form of an open circuit voltage limit as well as short circuit protection.

Figure F-3 shows the schematic diagram for the trickle charger. Figure F-4 shows the charger current profile.

Operation

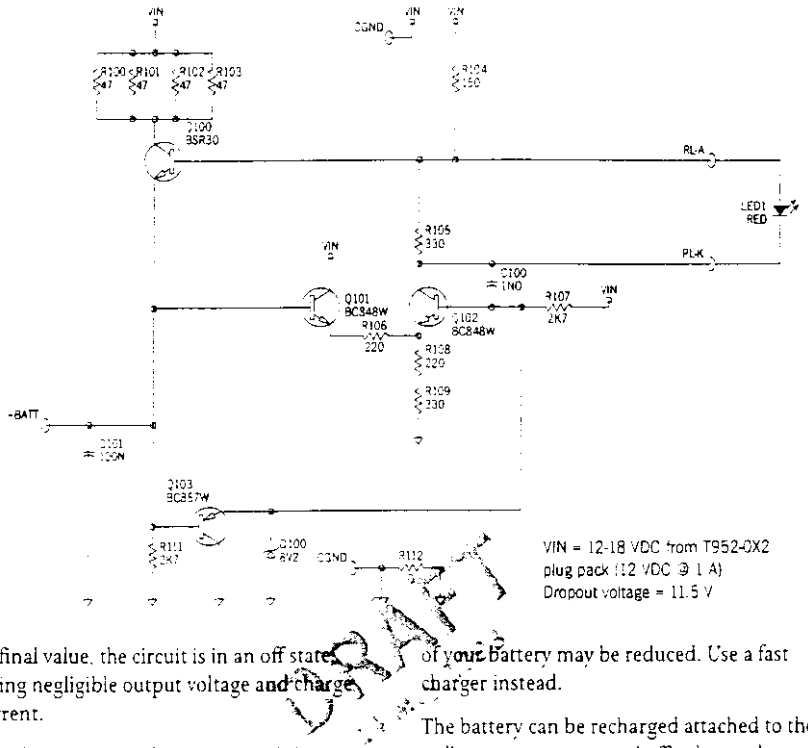
When the battery voltage is above approximately 8 V the charge current is inversely proportional to the battery voltage. This characteristic is produced by Q100, Q101 and Q102. The charge current is determined by the current through R104, which is set by Q102, its emitter resistors and the reference 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.

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

On startup, the charger is in a state very similar to what happens 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

Figure F-3: Circuit diagram of the Tait Orca desktop trickle charger.



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.

Charging the battery 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, make sure the battery/radio is seated properly and the charger is properly plugged in. The indicator will remain red until the radio is removed from the charger.

The battery will be fully charged in about 16 hours. Leave the battery in the charger until it is next needed; 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.

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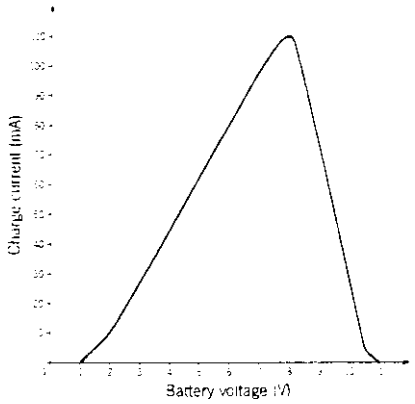

Figure F-4: Tait Orca desktop trickle charger current charge profile

Multi-charger

The multi-charger is made up of six desktop fast chargers. The PCB has an additional diode (see Figure F-5), and a tab has been added to the release clip at the base of the 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 unit with a fast charger unit to which the diode (IN4001 or similar???) has been added.

To remove a faulty charger from the multi-charger:

- Undo the screws at the base of the radio (x 10) 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 up and gently fold back.
- Remove the tab from the release clip of the faulty charger.
- Depress the release tab using the end of a flat-bladed screwdriver.
- Gently pull the body away from the base.
- Desolder wires??
- Repair the board or replace it with a new one to which the required diode has been added.
- Pass the wires through the bottom slit of the base of the charger.
- Solder the red wire to the positive terminal on the PCB and the black wire to the negative terminal on the PCB.
- Place the multi-charger unit on its side and make sure the charge/discharge button, the light pipe and the PCB are seated properly.
- Attach the base of the charger at the front edge and clip it in place.
- Replace the tab firmly between the release clip and the charger.
- Close up the multi-charger, replacing the 10 screws using a Pozi 1 driver.

Figure F-5: Placement of the diode for multi-charger PCBs

Operation

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

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PART G Interfacing non-Tait accessories

Contents

Interfacing non-Tait accessories

Two types of accessory connectors are available for Tait Orca handportables:

- standard Tait Orca accessory connector; and
- 7.5 mm accessory adaptor.

Tait Orca accessory connector

The Tait Orca handportable has a versatile accessory interface for connecting external accessories, such as speaker microphones, handsets and modems. An accessory kit (IPN OOPA-SSP-xxx) is available for connecting such accessories, and it contains:

- accessory connector PCB (IPN 220-01413-02);
- accessory connector lock (IPN 303-20058-00);
- lock retaining ring (IPN 303-20061-00);
- accessory connector housing (IPN 308-01055-00);
- screw M2*5 mm Pan Pozi (IPN 345-00020-00);
- bush M2 (IPN 354-01044-00);
- probe batt/RF (IPN 356-01070-00[TBD]);
- probe accessory x 15 (IPN 356-01072-00);
- clamp (IPN 357-01049-00);
- 6 mm, 5.3 mm and 4.4 mm grommets (IPN 360-02007-00); and
- generic accessory connector seal (IPN 362-01093-00).

Table G-1 shows the signals available at the accessory connector. A circuit diagram of the accessory connector is shown in Figure G-1, and the signals are described below.

Signals

- RX-DET-AF: The RX-DET-AF 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.
- +7.5V-ACC: The +7.5V-ACC line supplies +7.5 V to accessories.
- RXD: The RXD line carries data from the accessory connector to the controller during tasks such as radio programming and calibration.
- TXD: The TXD 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/SENSE-1: SENSE-0 and SENSE-1 lines are used to detect accessories.

  SENSE-0 is used to turn off the radio's internal speaker. To turn off the internal speaker, tie SENSE-0 to GND. The external speaker outputs are always active.

  SENSE-1 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 hands-free vehicle kit). To do this, tie SENSE-1 (pin 14) to GND. 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.

Table G-1: Accessory connector signal descriptions

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

*Dependent on battery charge level.

- EXT MIC: ???

  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.

- EXT-SPKR +/-: The EXT-SPKR +/- line can be used to drive an external speaker. Neither terminal should be grounded/ earthed as O/P is differential

- GND: The GND pin is the ground point at the accessory connector.

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

Accessory power

The 7V5-ACC supply 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.

Accessory function buttons

Two external 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.

6/98 IPN: 443-51000-00

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

These resistors are already soldered onto the accessory PCB.

Connecting an accessory

First determine whether your accessory is compatible with the accessory connector by referring to Table G-1. If it is compatible, determine which pads on the accessory PCB you will need to solder to by referring to Figure G-1.

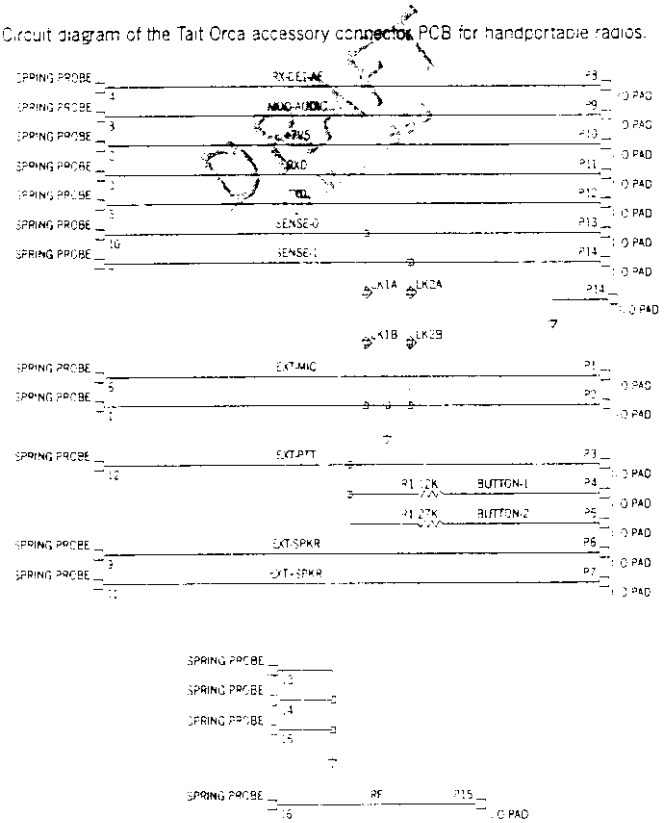
Short link 1 if it is necessary to turn off the radio's internal speaker. Then carefully follow the mechanical assembly procedure outlined below.

Mechanical assembly procedure

Figure G-2 shows an assembly drawing of the accessory connector. The order of assembly is as follows.

- Fit the lock to the accessory housing.

Figure G-1: Circuit diagram of the Tait Orca accessory connector PCB for handportable radios.



- Fit the retainer ring so that it holds the lock firmly to the housing.
- Thread the cable from your accessory through the accessory housing making sure it goes through in the proper direction.
- Slide a grommet of appropriate size onto the cable and pull firmly so the cable and grommet fit in place.
- Strip and tin the accessory signal wires.
- Solder the accessory wires to the correct pads on the PCB.
- Crimp the cable at an appropriate distance along the cable, approximately in line with the edge of the PCB.
- Use narrow-nose pliers to pull out the appropriate plugs in the seal and fit it onto the PCB.
- Fit the grommet and PCB/seal into the housing and secure it with the supplied screw.

Connecting a headset using the Tait Orca accessory connector

The headset must meet the following basic specifications:

- speaker impedance: 32Ω (16Ω min)
- speaker power: 1/4 W_{rms} (min)
- microphone: electret, approximately 1 kΩ
- PTT: switch not in line with microphone.

If your headset has a PTT in line with the microphone, it can be connected with the 7.5 mm accessory adaptor. See pages 59 to 60 for more information.

To connect a headset to your Tait Orca handportable, the connections shown in Table G-2 must be made:

To turn the radio speaker off and only have the headset speaker on, short link 1. This ties SENSE-0 to GND, telling the radio to turn the speaker off. SPEAKER+ and SPEAKER- must not short to GND or any other signal.

Procedure

- Determine the compatibility/suitability of your headset.
- Fit the lock to the accessory housing.
- Fit the retainer ring so that it holds the lock firmly to the housing.
- Thread the cable from the headset through the accessory connector housing.
- Slide a grommet of the appropriate size to the cable.
- Strip and tin the headset wires.
- Solder the headset wires onto the correct pads on the accessory connector PCB.
- Crimp the cable at an appropriate distance along the cable, approximately in line with the edge of the PCB.
- Use narrow-nose pliers to pull out the appropriate plugs in the seal and fit it onto the PCB.
- Fit the grommet and PCB/seal into the housing and secure it with the supplied screw.

Connecting a modem using the Tait Orca accessory connector

A data modem can be connected to your Tait Orca handportable to provide a wireless data link.

The MOD-AUDIO and RX-DET-AF signals provide direct connection points.

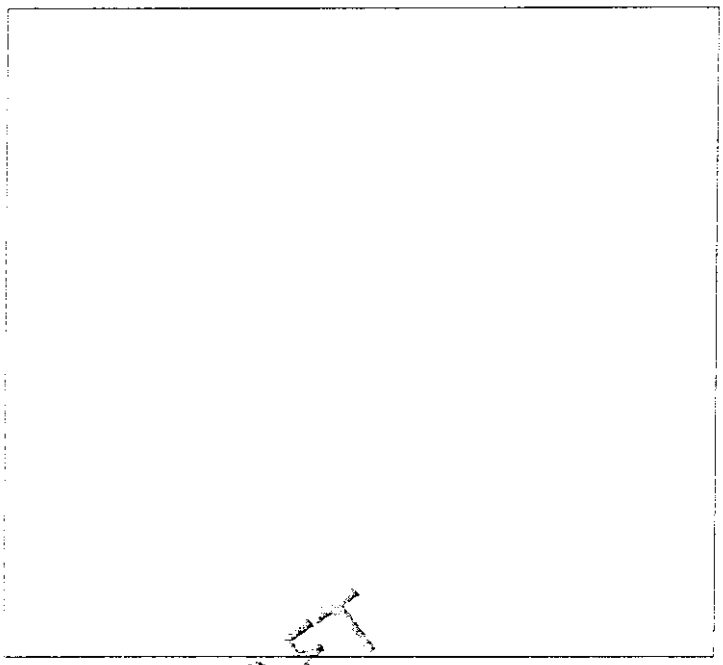
Connecting the modem output

The output of the modem is connected to the MOD-AUDIO input. This connection must be AC coupled or the radio will not perform correctly.

The modem's output signal must be within the envelope shown in Figure G-3. If the

s-98 IPN: 449-51000-00

Figure G-2: Assembly diagram of the accessory connector



modem output is not directly suitable, you must provide filtering to ensure the signal is within this envelope.

Setting the signal level

The 0 dB reference level shown in Figure G-3 is determined by setting the peak detected modem output signal level so that you get 60 percent full system deviation. The peak point in the spectrum of the modem output must occur at a frequency less than 3 kHz. The MOD-AUDIO input signal can extend down to DC.

To prevent the internal microphone and audio path interfering with the modem's transmit signal, the internal microphone must be disabled. To do this, tie EXT-MIC to ground via a 10 kΩ resistor.

Sending data

When the modem is to send data, the EXT-PTT line must be held low (0 V) to key up the transmitter. The transmitter takes (??) ms to key up, and so no data can be sent during this time.

Connecting the modem input

The modem input is connected to the radio's RX-DET-AF output. The DC bias of RX-DET-AF can vary, and so AC coupling is recommended. The frequency response of RX-DET-AF is shown in Figure G-4.

Group delay

The radio's group delay distortion is less than 150 µs for both the receive and transmit paths.

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.

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 G-5.

The 7.5 mm accessory adaptor differs from the standard accessory connector in that the 7.5 mm connector the PTT signal is in series with the microphone signal. The standard accessory connector has separate PTT and microphone signals.

The main function of the 7.5 mm adaptor is, therefore, 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 G-6 shows the schematic 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 G-6). This pulls Q3 low turning it on. Q3 in turn pulls the base of Q2 high which pulls the EXT-PTT line low, which enables 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 Q1 will not turn off due to the voltage swing of the signal.

Figure G-3: descriptive title

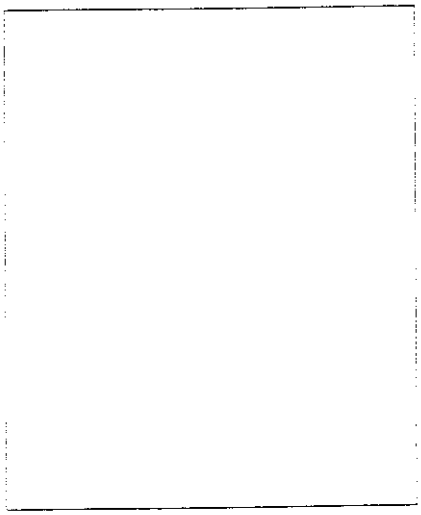


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Figure G-4: two graphs, one wideband, one narrowband

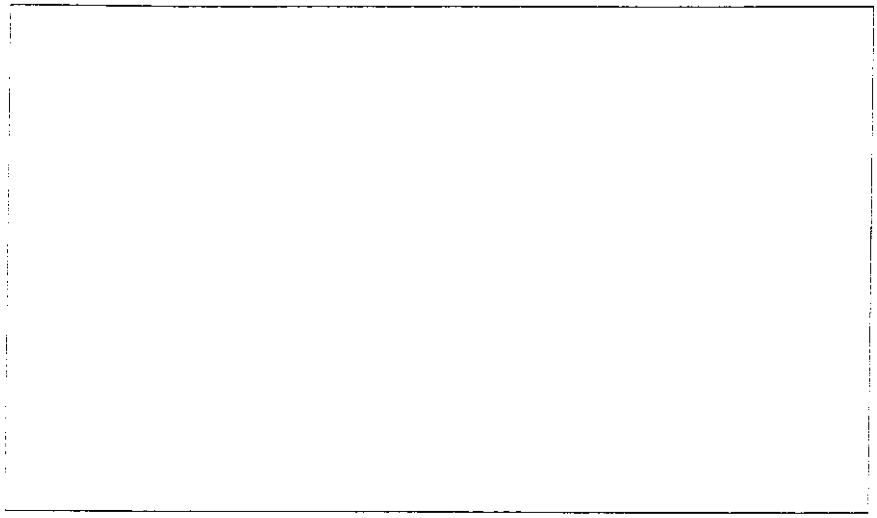


Figure G-5: Plugs for the 7.5 mm accessory adaptor

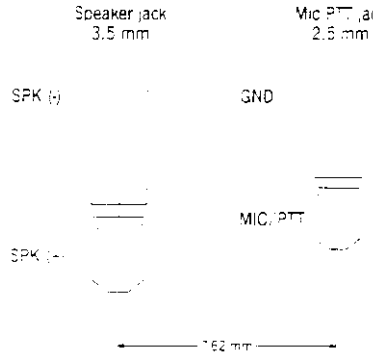
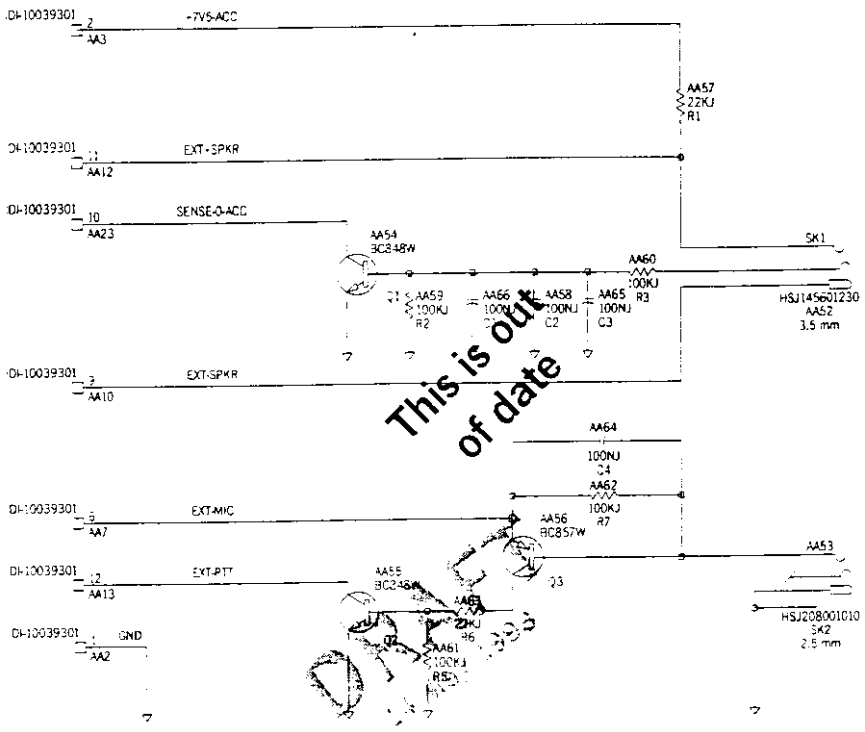


Figure G-6: Circuit diagram of the 7.5 mm accessory adaptor PCB for handportable radios



PART H Additional information

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).

CSN
Chassis serial number.

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.

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.

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.

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.

LCCC
Leadless ceramic chip carrier.

LCD
Liquid crystal display.

LED
Light emitting diode.

LPF
Low pass filter.

MCU
Micro control unit.

MELF
Metal electrode face bonded.

MTM
Manual test mode. The operating mode where test commands are requested via the keypad of the radio and results are returned to the front panel display. [this was ono the 3040s only]

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.

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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**.

QFP
Quad flat pack.

PSTN
Public service telephone network. [is this right????]

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.

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 link (manual)
A physical connection that must be linked on the control PCB in order to put the radio into manual test mode.

test link (sticky)
A programmable item that, when set, causes the radio to always power on in **manual test mode** (i.e. a 'virtual' link).

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.

test mode (manual)
The operating mode of the radio where test commands are requested via the keypad of the radio and results are returned to the front panel dispiay. [check, this was 3040s only]

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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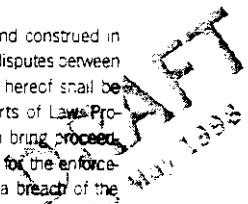

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