

PART **B** Radio specifications and circuit descriptions

This part outlines the radio specifications and circuit descriptions for Tait Orca portable radios.

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Radio specifications

Tables B-1, B-2 and B-3 show information common to all the radios. For detailed information on each band, refer to the performance figures outlined in Tables B-4 to B-11.

The performance figures are typical figures, unless otherwise stated, for equipment operating at standard room temperature.

The test methods used to obtain these figures are those described in the European Telecommunication Standard ETS 300-086. Where applicable, the EIA figure is also given.

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

Important notes for Tables B-4 to B-11

With regard to the typical performance figures, specifications are subject to change without notice and shall not form part of any contract. They are issued for guidance purposes only. For further information please check with your nearest Tait office or authorised dealer who can confirm that the radio meets applicable regulatory requirements.

* Tait Orca products have an intermediate (universal) IF bandwidth and can be programmed per channel for 2.5, 4.0 or 5.0 kHz deviation to cover any channel spacing. See “Universal band versus wideband IF filtering” on page B-15.

† TOPB600 batteries are recommended for use with conventional radios (Orca 501x/2x) only.

Table B-1: General specifications

Parameter	Performance
Supply voltage	6.0 to 9.0 V
Standard test voltage	7.5 V

Table B-2: Receiver performance

Parameter	Performance
Audio	
Minimum load impedance	13 Ω
Rated power	500 mW (1kHz, 60% deviation into 16 Ω)
Distortion	<5% (1kHz, 60% deviation at rated power into 16 Ω)
Response	-6 dB/oct +1, -3 dB (relative to 1 kHz), 300-2550 Hz (narrowband) 300-3000 Hz (wideband)
Spurious emissions	
to 1 GHz	-57 dBm (conducted and radiated)
1 to 4 GHz (136-470 MHz)	-47 dBm (conducted and radiated)
1 to 12.75 GHz (>470 MHz)	-47 dBm (conducted only)
Group delay variation	$\pm 50 \mu\text{s}$ (at detected audio output) bandwidth 300-3000 Hz
RSSI	
range	-120 to -40 dBm
slope	29 mV/dB (typical)

Table B-3: Transmitter performance

Parameter	Performance
Duty cycle	20% (1 minute Tx, 4 minutes Rx at maximum temperature and voltage)
Group delay variation bandwidth	$\pm 50 \mu\text{s}$ (at mod audio output) 300-3000 Hz
Trunking data deviation (as per MPT1327)	
narrowband	1.5 kHz
mediumband	2.4 kHz
wideband	3 kHz
Audio response	
below limiting	6 dB/oct +1, -3 dB (relative to 1 kHz) 300-3000 Hz
in limiting	0 dB +0, -4 dB (relative to maximum system deviation) 450-2550 Hz
above 3 kHz	-35 dB/oct min
input for 60% deviation	5 mV _{rms}
distortion	<5% at 1 kHz
Ruggedness	2 minutes (into infinite VSWR)
Stability	5:1 VSWR (all phase angles, <60 dBc)

Table B-4: TOP-Axxxx 66-88MHz radio specifications

General	Orca 501x/2x	Orca 503x/40	
Frequency Range	66-88MHz		
Channel Spacing	12.5 / 20 / 25 kHz		
Frequency Increments	5 or 6.25kHz		
IF Bandwidth	Universal Bandwidth (UB) 10kHz*		
Frequency Stability	+/-15ppm (-20 to -10°C); +/-10ppm (-10 to +60°C)		
Current Consumption (Receiver Squelched)	80mA	100mA	
Current Consumption (Standby with high economy duty cycle)	40mA	N/A	
Current Consumption (Receiver Rated Audio)	300mA		
Transmitter current (Low/High power)	800mA/1.6A		
Size, incl. 1500mAh NiMH battery (WxHxD)	66 x 154 x 41mm		
Weight	Orca 5010/11/30	Orca 5035	Orca 5015/2x/40
With TOPB600 1100mAh NiCd†	490g	510g	515g
With TOPB200 1500mAh NiCd	525g	545g	550g
With TOPB700 1500mAh NiMH	510g	530g	535g
With TOPB500 2000mAh NiMH	550g	570g	575g
Receiver			
Measurements as per:	ETS 300-086		
Intermediate frequencies	21.4MHz and 455kHz		
Sensitivity 12dB SINAD	< -119dBm		
Sensitivity 20dB SINAD	< -114dBm		
Fixed Squelch Sensitivity	12dB SINAD or 16dB SINAD Nominal		
Selectivity	70dB (NB), 75dB (WB)*		
Spurious Response	70dB		
Intermodulation	65dB		
Blocking	94dB		
Ultimate Signal to Noise Ratio (EIA)	39dB (NB), 44dB (WB)*		
Audio Response (300 Hz - 2.55 kHz)	Within +1 / -3dB of 6dB / Octave De-emphasis		
Distortion (EIA)	<5% @ 1kHz, 60% Deviation		
Rated Audio Output	> 500mW nominal		
Transmitter			
Measurements as per:	ETS 300-086		
Power Output (Low/Mid/High)	1 / 2.5 / 5W		
Spurious Emissions (Cond. & Rad.)	< -36dBm (0-1GHz), < -30dBm (1-4GHz)		
Hum and Noise (EIA)	38dB (NB), 43dB (WB)*		
Modulation Type* narrowband	10K0F3E		
wideband	16K0F3E		
Deviation Limiting	Adjustable up to +/- 5kHz		
Audio Response (300 Hz - 2.55 kHz)	Within +1 / -3dB of 6dB / Octave Pre-emphasis		
Distortion (EIA)	<5% @ 1kHz, 60% Deviation		

*, † See "Important notes for Tables B-4 to B-11" on page B-3.

Table B-5: TOP-Bxxx 136-174MHz radio specifications

General	Orca 501x/2x	Orca 503x/40	
Frequency Range	136-174MHz		
Channel Spacing	12.5 / 20 / 25 kHz		
Frequency Increments	5 or 6.25kHz		
IF Bandwidth	Universal Bandwidth (UB) 10kHz*		
Frequency Stability	+/-2.5ppm (-30 to +60°C)		
Current Consumption (Receiver Squelched)	80mA	100mA	
Current Consumption (Standby with high economy duty cycle)	40mA	N/A	
Current Consumption (Receiver Rated Audio)	300mA		
Transmitter current (Low/High power)	810mA/1.6A		
Size, incl. 1500mAh NiMH battery (WxHxD)	66 x 154 x 41mm		
Weight	Orca 5010/11/30	Orca 5035	Orca 5015/2x/40
With TOPB600 1100mAh NiCd†	490g	510g	515g
With TOPB200 1500mAh NiCd	525g	545g	550g
With TOPB700 1500mAh NiMH	510g	530g	535g
With TOPB500 2000mAh NiMH	550g	570g	575g
Receiver			
Measurements as per:	ETS 300-086		
Intermediate frequencies	21.4MHz and 455kHz		
Sensitivity 12dB SINAD	< -119dBm		
Sensitivity 20dB SINAD	< -114dBm		
Fixed Squelch Sensitivity	12dB SINAD or 16dB SINAD Nominal		
Selectivity	70dB (NB), 75dB (WB)*		
Spurious Response	70dB		
Intermodulation	65dB		
Blocking	94dB		
Ultimate Signal to Noise Ratio (EIA)	37dB (NB), 42dB (WB)*		
Audio Response (300 Hz - 2.55 kHz)	Within +1 / -3dB of 6dB / Octave De-emphasis		
Distortion (EIA)	<5% @ 1kHz, 60% Deviation		
Rated Audio Output	> 500mW nominal		
Transmitter			
Measurements as per:	ETS 300-086		
Power Output (Low/Mid/High)	1 / 2.5 / 5W		
Spurious Emissions (Cond. & Rad.)	< -36dBm (0-1GHz), < -30dBm (1-4GHz)		
Hum and Noise (EIA)	36dB (NB), 42dB (WB)*		
Modulation Type* narrowband	10K0F3E		
wideband	16K0F3E		
Deviation Limiting	Adjustable up to +/- 5kHz		
Audio Response (300 Hz - 2.55 kHz)	Within +1 / -3dB of 6dB / Octave Pre-emphasis		
Distortion (EIA)	<5% @ 1kHz, 60% Deviation		

*, † See "Important notes for Tables B-4 to B-11" on page B-3.

Table B-6: TOP-Cxxxx 174-225MHz radio specifications

General	Orca 501x/2x	Orca 503x/40	
Frequency Range	174-225MHz		
Channel Spacing	12.5 / 20 / 25 kHz		
Frequency Increments	5 or 6.25kHz		
IF Bandwidth	Universal Bandwidth (UB) 10kHz*		
Frequency Stability	+/-2.5ppm (-30 to +60°C)		
Current Consumption (Receiver Squelched)	80mA	100mA	
Current Consumption (Standby with high economy duty cycle)	40mA	N/A	
Current Consumption (Receiver Rated Audio)	300mA		
Transmitter current (Low/High power)	800mA/ 1.5A		
Size, incl. 1500mAh NiMH battery (WxHxD)	66 x 154 x 41mm		
Weight	Orca 5010/11/30	Orca 5035	Orca 5015/2x/40
With TOPB600 1100mAh NiCd†	490g	510g	515g
With TOPB200 1500mAh NiCd	525g	545g	550g
With TOPB700 1500mAh NiMH	510g	530g	535g
With TOPB500 2000mAh NiMH	550g	570g	575g
Receiver			
Measurements as per:	ETS 300-086		
Intermediate frequencies	21.4MHz and 455kHz		
Sensitivity 12dB SINAD	< -119dBm		
Sensitivity 20dB SINAD	< -114dBm		
Fixed Squelch Sensitivity	12dB SINAD or 16dB SINAD Nominal		
Selectivity	70dB (NB), 75dB (WB)*		
Spurious Response	70dB		
Intermodulation	65dB		
Blocking	94dB		
Ultimate Signal to Noise Ratio (EIA)	37dB (NB), 42dB (WB)*		
Audio Response (300 Hz - 2.55 kHz)	Within +1 / -3dB of 6dB / Octave De-emphasis		
Distortion (EIA)	<5% @ 1kHz, 60% Deviation		
Rated Audio Output	> 500mW nominal		
Transmitter			
Measurements as per:	ETS 300-086		
Power Output (Low/Mid/High)	1 / 2.5 / 4W		
Spurious Emissions (Cond. & Rad.)	< -36dBm (0-1GHz), < -30dBm (1-4GHz)		
Hum and Noise (EIA)	36dB (NB), 42dB (WB)*		
Modulation Type* narrowband	10K0F3E		
wideband	16K0F3E		
Deviation Limiting	Adjustable up to +/- 5kHz		
Audio Response (300 Hz - 2.55 kHz)	Within +1 / -3dB of 6dB / Octave Pre-emphasis		
Distortion (EIA)	<5% @ 1kHz, 60% Deviation		

*, † See "Important notes for Tables B-4 to B-11" on page B-3.

Table B-7: TOP-Gxxx 336-400MHz radio specifications

General	Orca 501x/2x	Orca 503x/40	
Frequency Range	336-400MHz		
Channel Spacing	12.5 / 20 / 25 kHz		
Frequency Increments	5 or 6.25kHz		
IF Bandwidth	Universal Bandwidth (UB) 10kHz*		
Frequency Stability	+/-2.5ppm (-30 to +60°C)		
Current Consumption (Receiver Squelched)	85mA	100mA	
Current Consumption (Standby with high economy duty cycle)	40mA	N/A	
Current Consumption (Receiver Rated Audio)	300mA		
Transmitter current (Low/High power)	900mA/1.7A		
Size, incl. 1500mAh NiMH battery (WxHxD)	66 x 154 x 41mm		
Weight	Orca 5010/11/30	Orca 5035	Orca 5015/2x/40
With TOPB600 1100mAh NiCd†	490g	510g	515g
With TOPB200 1500mAh NiCd	525g	545g	550g
With TOPB700 1500mAh NiMH	510g	530g	535g
With TOPB500 2000mAh NiMH	550g	570g	575g
Receiver			
Measurements as per:	ETS 300-086		
Intermediate frequencies	45.1MHz and 455kHz		
Sensitivity 12dB SINAD	< -119dBm		
Sensitivity 20dB SINAD	< -114dBm		
Fixed Squelch Sensitivity	12dB SINAD or 16dB SINAD Nominal		
Selectivity	66dB (NB), 72dB (WB)*		
Spurious Response	70dB		
Intermodulation	65dB		
Blocking	94dB		
Ultimate Signal to Noise Ratio (EIA)	36dB (NB), 42dB (WB)*		
Audio Response (300 Hz - 2.55 kHz)	Within +1 / -3dB of 6dB / Octave De-emphasis		
Distortion (EIA)	<5% @ 1kHz, 60% Deviation		
Rated Audio Output	> 500mW nominal		
Transmitter			
Measurements as per:	ETS 300-086		
Power Output (Low/Mid/High)	1 / 2.5 / 4W		
Adjacent Channel Power	65dB (NB), 75dB (WB)*		
Spurious Emissions (Cond. & Rad.)	< -36dBm (0-1GHz), < -30dBm (1-4GHz)		
Hum and Noise (EIA)	37dB (NB), 43dB (WB)*		
Modulation Type* narrowband	10K0F3E		
wideband	16K0F3E		
Deviation Limiting	Adjustable up to +/- 5kHz		
Audio Response (300 Hz - 2.55 kHz)	Within +1 / -3dB of 6dB / Octave Pre-emphasis		
Distortion (EIA)	<5% @ 1kHz, 60% Deviation		

*, † See "Important notes for Tables B-4 to B-11" on page B-3.

Table B-8: TOP-Hxxxx 400-470MHz radio specifications

General	Orca 501x/2x	Orca 503x/40	
Frequency Range	400-470MHz		
Channel Spacing	12.5 / 20 / 25 kHz		
Frequency Increments	5 or 6.25kHz		
IF Bandwidth	Universal Bandwidth (UB) 10kHz*		
Frequency Stability	+/-2.5ppm (-30 to +60°C)		
Current Consumption (Receiver Squelched)	80mA	100mA	
Current Consumption (Standby with high economy duty cycle)	40mA	N/A	
Current Consumption (Receiver Rated Audio)	300mA		
Transmitter current (Low/High power)	780mA/ 1.5A		
Size, incl. 1500mAh NiMH battery (WxHxD)	66 x 154 x 41mm		
Weight	Orca 5010/11/30	Orca 5035	Orca 5015/2x/40
With TOPB600 1100mAh NiCd†	490g	510g	515g
With TOPB200 1500mAh NiCd	525g	545g	550g
With TOPB700 1500mAh NiMH	510g	530g	535g
With TOPB500 2000mAh NiMH	550g	570g	575g
Receiver			
Measurements as per:	ETS 300-086		
Intermediate Frequencies	45.1MHz and 455kHz		
Sensitivity 12dB SINAD	< -119dBm		
Sensitivity 20dB SINAD	< -114dBm		
Fixed Squelch Sensitivity	12dB SINAD or 16dB SINAD Nominal		
Selectivity	66dB (NB), 72dB (WB)*		
Spurious Response	70dB		
Intermodulation	65dB		
Blocking	94dB		
Ultimate Signal to Noise Ratio (EIA)	34dB (NB), 40dB (WB)*		
Audio Response (300 Hz - 2.55 kHz)	Within +1 / -3dB of 6dB / Octave De-emphasis		
Distortion (EIA)	<5% @ 1kHz, 60% Deviation		
Rated Audio Output	> 500mW nominal		
Transmitter			
Measurements as per:	ETS 300-086		
Power Output (Low/Mid/High)	1 / 2.5 / 4W		
Spurious Emissions (Cond. & Rad.)	< -36dBm (0-1GHz), < -30dBm (1-4GHz)		
Hum and Noise (EIA)	35dB (NB), 41dB (WB)*		
Modulation Type* narrowband	10K0F3E		
wideband	16K0F3E		
Deviation Limiting	Adjustable up to +/- 5kHz		
Audio Response (300 Hz - 2.55 kHz)	Within +1 / -3dB of 6dB / Octave Pre-emphasis		
Distortion (EIA)	<5% @ 1kHz, 60% Deviation		

*, † See "Important notes for Tables B-4 to B-11" on page B-3.

Table B-9: TOP-Ixxxx 450-530MHz radio specifications

General	Orca 501x/2x	Orca 503x/40	
Frequency Range	450-530MHz		
Channel Spacing	12.5 / 20 / 25 kHz		
Frequency Increments	5 or 6.25kHz		
IF Bandwidth	Universal Bandwidth (UB) 10kHz*		
Frequency Stability	+/-2.5ppm (-30 to +60°C)		
Current Consumption (Receiver Squelched)	80mA	100mA	
Current Consumption (Standby with high economy duty cycle)	40mA	N/A	
Current Consumption (Receiver Rated Audio)	300mA		
Transmitter current (Low/High power)	870mA/1.7A		
Size, incl. 1500mAh NiMH battery (WxHxD)	66 x 154 x 41mm		
Weight	Orca 5010/11/30	Orca 5035	Orca 5015/2x/40
With TOPB600 1100mAh NiCd†	490g	510g	515g
With TOPB200 1500mAh NiCd	525g	545g	550g
With TOPB700 1500mAh NiMH	510g	530g	535g
With TOPB500 2000mAh NiMH	550g	570g	575g
Receiver			
Measurements as per:	ETS 300-086		
Intermediate frequencies	45.1MHz and 455kHz		
Sensitivity 12dB SINAD	< -119dBm		
Sensitivity 20dB SINAD	< -114dBm		
Fixed Squelch Sensitivity	12dB SINAD or 16dB SINAD Nominal		
Selectivity	66dB (NB), 72dB (WB)*		
Spurious Response	70dB		
Intermodulation	65dB		
Blocking	94dB		
Ultimate Signal to Noise Ratio (EIA)	34dB (NB), 40dB (WB)*		
Audio Response (300 Hz - 2.55 kHz)	Within +1 / -3dB of 6dB / Octave De-emphasis		
Distortion (EIA)	<5% @ 1kHz, 60% Deviation		
Rated Audio Output	> 500mW nominal		
Transmitter			
Measurements as per:	ETS 300-086		
Power Output (Low/Mid/High)	1 / 2.5 / 4W		
Spurious Emissions (Cond. & Rad.)	< -36dBm (0-1GHz), < -30dBm (1-4GHz)		
Hum and Noise (EIA)	34dB (NB), 40dB (WB)*		
Modulation Type* narrowband	10K0F3E		
wideband	16K0F3E		
Deviation Limiting	Adjustable up to +/- 5kHz		
Audio Response (300 Hz - 2.55 kHz)	Within +1 / -3dB of 6dB / Octave Pre-emphasis		
Distortion	<5% @ 1kHz, 60% Deviation		

*, † See "Important notes for Tables B-4 to B-11" on page B-3.

Table B-10: TOP-Jxxx 806-870MHz radio specifications

General	Orca 501x/2x	Orca 503x/40	
Frequency Range	806-870MHz Transmit 851-870MHz Receive		
Channel Spacing	12.5 / 20 / 25 kHz		
Frequency Increments	5 or 6.25kHz		
IF Bandwidth	Universal Bandwidth (UB) 10kHz*		
Frequency Stability	+/-1.5ppm (-30 to +60°C)		
Current Consumption (Receiver Squelched)	85 mA	100mA	
Current Consumption (Standby with high economy duty cycle)	40 mA	N/A	
Current Consumption (Receiver Rated Audio)	300mA		
Transmitter current (Low/High power)	780mA/1.3A		
Size, incl. 1500mAh NiMH battery (WxHxD)	66 x 154 x 41mm		
Weight	Orca 5010/11/30	Orca 5035	Orca 5015/2x/40
With TOPB600 1100mAh NiCd†	490g	510g	515g
With TOPB200 1500mAh NiCd	525g	545g	550g
With TOPB700 1500mAh NiMH	510g	530g	535g
With TOPB500 2000mAh NiMH	550g	570g	575g
Receiver			
Measurements as per:	EIA		
Intermediate frequencies	45.1MHz and 455kHz		
Sensitivity 12dB SINAD	< 0.25µV (-119dBm)		
Sensitivity 20dB SINAD	< 0.40 µV (-114dBm)		
Fixed Squelch Sensitivity	12dB SINAD or 16dB SINAD Nominal		
Selectivity	60dB (NB), 65dB (WB)*		
Spurious Response	65dB		
Intermodulation	65dB		
Hum and Noise	32dB (NB), 38dB (WB)*		
Audio Response (300 Hz - 2.55 kHz)	Within +1 / -3dB of 6dB / Octave De-emphasis		
Rated Audio Output	> 500mW nominal		
Transmitter			
Measurements as per:	EIA		
Power Output (Low/Mid/High)	1 / 2 / 3W		
Spurious Emissions (Cond. & Rad.)	- 65dB		
Hum and Noise	38dB (NB), 42dB (WB)*		
Modulation Type* narrowband	10K0F3E		
wideband	16K0F3E		
Deviation Limiting	Adjustable up to +/- 5kHz		
Audio Response (300 Hz - 2.55 kHz)	Within +1 / -3dB of 6dB / Octave Pre-emphasis		
Distortion	<5% @ 1kHz, 60% Deviation		

* , † See "Important notes for Tables B-4 to B-11" on page B-3.

Table B-11: TOP-Kxxx 896-941MHz radio specifications

General	Orca 501x/2x	Orca 503x/40	
Frequency Range	896-941MHz Transmit 935-941MHz Receive		
Channel Spacing	12.5 / 20 / 25 kHz		
Frequency Increments	5 or 6.25kHz		
IF Bandwidth	Universal Bandwidth (UB) 10kHz*		
Frequency Stability	+/-1.5ppm (-30 to +60°C)		
Current Consumption (Receiver Squelched)	85 mA	100mA	
Current Consumption (Standby with high economy duty cycle)	40 mA	N/A	
Current Consumption (Receiver Rated Audio)	300mA		
Transmitter current (Low/High power)	750mA/1.3A		
Size, incl. 1500mAh NiMH battery (WxHxD)	66 x 154 x 41mm		
Weight	Orca 5010/11/30	Orca 5035	Orca 5015/2x/40
With TOPB600 1100mAh NiCd†	490g	510g	515g
With TOPB200 1500mAh NiCd	525g	545g	550g
With TOPB700 1500mAh NiMH	510g	530g	535g
With TOPB500 2000mAh NiMH	550g	570g	575g
Receiver			
Measurements as per:	EIA		
Intermediate frequencies	45.1MHz and 455kHz		
Sensitivity 12dB SINAD	<0.25µV (-119dBm)		
Sensitivity 20dB SINAD	<0.40µV (-114dBm)		
Fixed Squelch Sensitivity	12dB SINAD or 16dB SINAD Nominal		
Selectivity	60dB (NB), 65dB (WB)*		
Spurious Response	60dB		
Intermodulation	65dB		
Hum and Noise	32dB (NB), 38dB (WB)*		
Audio Response (300 Hz - 2.55 kHz)	Within +1 / -3dB of 6dB / Octave De-emphasis		
Rated Audio Output	> 500mW nominal		
Transmitter			
Measurements as per:	EIA		
Power Output (Low/Mid/High)	1 / 2 / 3W		
Spurious Emissions (Cond. & Rad.)	-65dB		
Hum and Noise	38dB (NB), 42dB (WB)*		
Modulation Type* narrowband	10K0F3E		
wideband	16K0F3E		
Deviation Limiting	Adjustable up to +/- 5kHz		
Audio Response (300 Hz - 2.55 kHz)	Within +1 / -3dB of 6dB / Octave Pre-emphasis		
Distortion	<5% @ 1kHz, 60% Deviation		

*, † See "Important notes for Tables B-4 to B-11" on page B-3.

Circuit descriptions

Circuit interface diagrams for the Tait Orca portable radios are shown in Figure A-1 (TOP B, C, G, H, I, J and K) and Figure A-2 (TOP A only).

The Tait Orca portable radio has been designed to be totally electronically tuned using the *Calibration Application*. The titles of tests referred to below are tests available in the calibration system, e.g. **Power Level** test refers to the **Power Level** screen in the calibration system. Consult the Calibration Application online help or 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 (3W 800/900 MHz, 4W UHF, 5W VHF). The PA output is fed to the PIN switch, which provides isolation between the transmit and receive paths.

An 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 by the DSP and associated circuitry 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 rejects unwanted frequencies. The front end is electronically tuned, and the front end tuning voltage that sets the centre of the bandpass filter is determined 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 two crystal filters, separated by the IF amplifier.

In the Demod IC, the signal passes through the second mixer, producing the second IF (455 kHz). The second IF passes through a ceramic 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 ceramic band pass filter. The final stage is the phase lock loop (PLL) discriminator in the Demod IC, which produces detected audio.

A squelch detect circuit detects high frequency audio noise and compares it with a threshold (programmable as **city** or **country** for each channel), which is set up by the microprocessor. The squelch level 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).

Receive (Rx) audio

The detected audio is processed by the DSP, amplified and fed to an internal speaker,

whose selection is controlled by a line from the microprocessor. The speaker output is always available on the accessory connector to drive an external speaker.

The unprocessed audio from the output of the demodulator IC (RX-DET-AF) is also available at the accessory connector.

DSP

All signalling, such as Selcall, CTCSS, DCS, G-STAR, DTMF and FFSK, and all confidence tones are generated by the DSP. However, only Selcall, CTCSS, FFSK and Two-tone are decoded by the DSP.

The DSP operates in half-duplex mode. That is, its CODEC input and output is switched between the Tx and Rx audio paths, according to whether the radio is transmitting or receiving.

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 one or two VCOs, depending on the radio type. Some bands have one VCO that covers the whole tuning range of the radio plus the IF offset, with its output switched to Tx or Rx. Other bands have a dedicated Tx and Rx VCO.

A lock detect output from the synthesiser (LCK-DET) 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, and informs the control microprocessor.

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 a 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, mainly all analog circuitry in the receiver, synthesiser and audio modules. 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.

+7V5-BATT

The +7V5-BATT supply is the unregulated voltage supplied to the radio from the battery.

+7V5-ACC

The +7V5-ACC supply is supplied to the accessory connector from the battery through a switch and a current limiter.

+7V5-SW

The +7V5-SW switched supply is an unregulated voltage supplied to the radio from the battery through a switch.

+14V

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

A switch mode regulator produces this voltage from the +7V5-SW and +5V-AN supplies.

+4V3-DEC

The +4V3-DEC supply is derived from the +5V-AN voltage. It is used to power the transmit and receive VCOs in conjunction with the transmit control line from the processor. It also provides the loop filter reference in the synthesiser.

Accessory connector interface

The accessory connector interface is described in *Part F: Accessories*.

Universal band versus wideband IF filtering

The IF filtering for the universal band is designed in such a way that it functionally meets specifications for both narrowband and wideband systems.

The Deviation and Receive Audio Processing are selectable per channel, which enables the radio to inter-operate between narrowband and wideband channels.

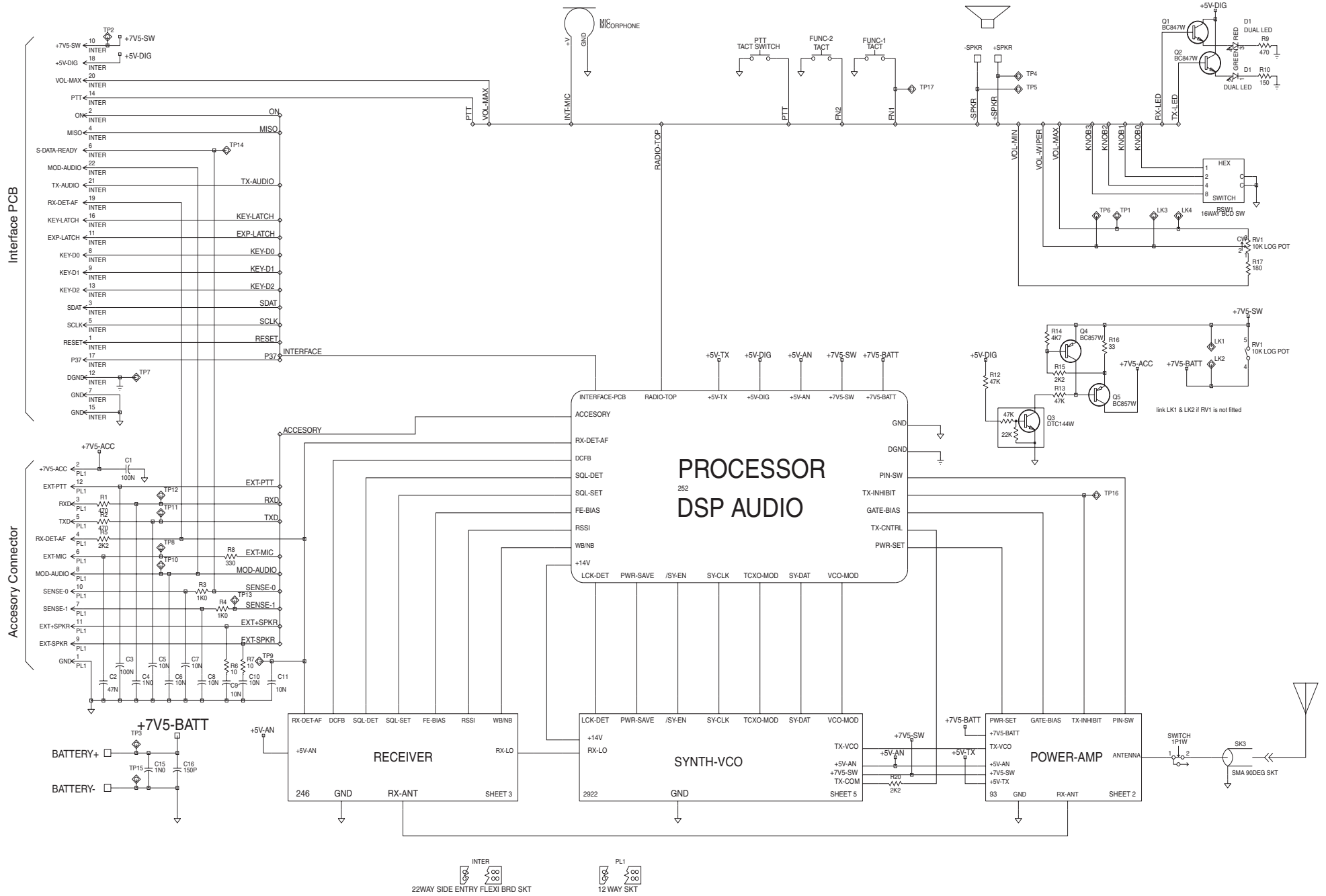


Figure B-1: Circuit interface diagram for Tait Orca portable radios (TOP B, C, G, H, I, J and K)

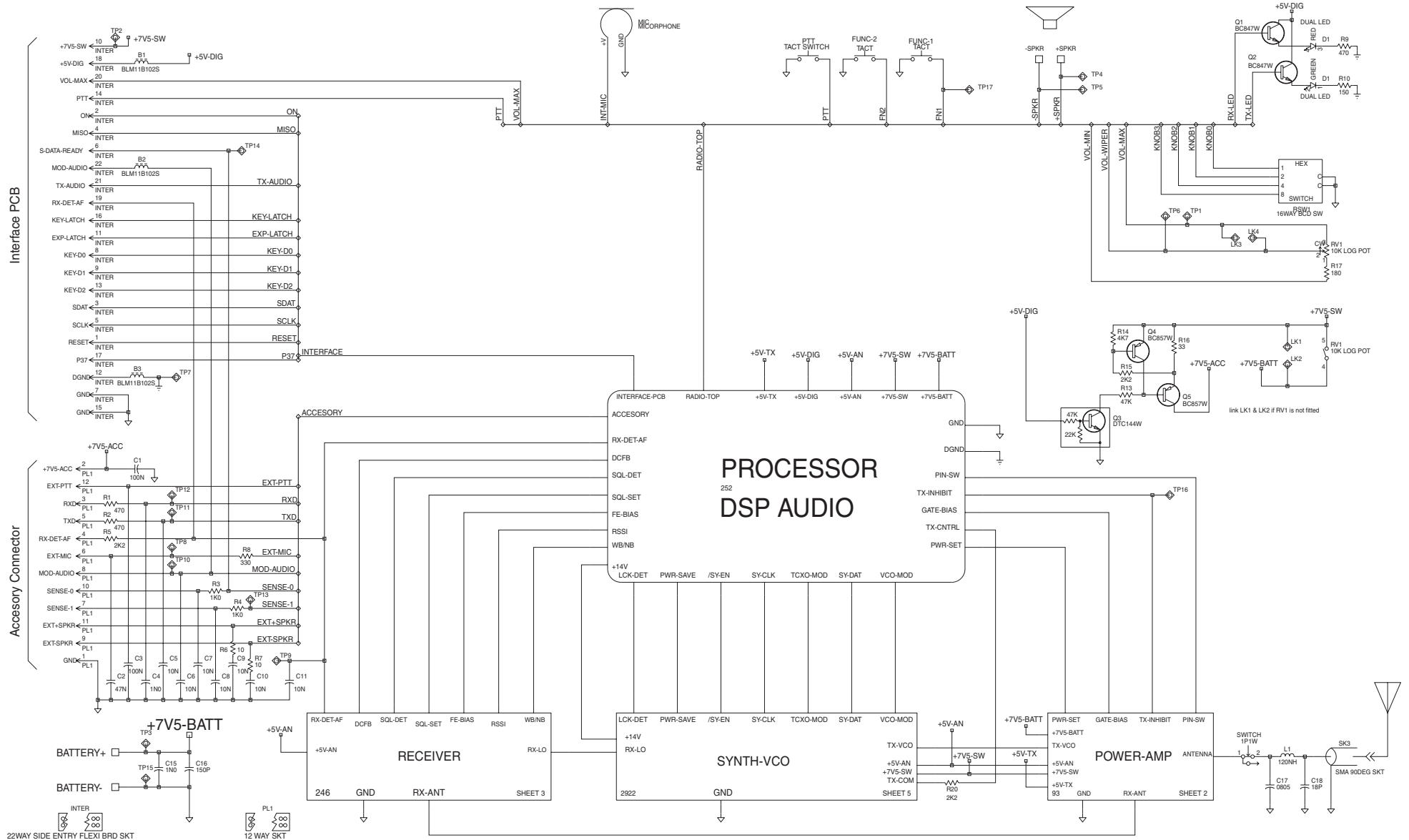


Figure B-2: Circuit interface diagram for Tait Orca portable radios (TOP A only)

