APPENDIX A:

PRODUCT DESCRIPTION

A1: PRODUCT SPECIFICATION

(TRANSMITTER)

Uppgjord (även faktaansvarig om annan) - Prepared (also subject responsible if other)		Nr - No.	
EUS/LT/A Jerry Ferr	(804) 592-5419	7/1524 KRD 103 162 Uen	
Dokansv/Godk - Doc respons/Approved	Kontr - Checked	Datum - Date	Rev / File
EUS/LT/A Jerry Ferr		1999-09-07	A

TRANSMITTER SPECIFICATIONS

LOW TIER EDACS PORTABLE RADIOS

1. Scope

These are the transmitter specifications for the EH-8031 portable radios designed and manufactured for Ericsson Inc. The radios must meet these specifications at any frequency within the frequency split without any re-tuning.

1.1. Reference Drawings and Specifications

This document is one of a series of documents describing requirements for this transceiver, and is not a stand-alone specification. Additional requirements for this radio appear in many different documents. A complete list of all documents describing requirements for this transceiver, as well as a complete list of reference documents, is included in the following document:

ERICSSON PRODUCT SPECIFICATION (DOCUMENT NUMBER: 1301 KRD 103 162 Uen)

1.2. Definitions and Abbreviations

See product specification.

2. Specifications at Standard Test Conditions

PARAMETER	SPECIFICATION LIMITS	COMMENTS

Uppgjord (även faktaansvarig om annan) - Prepared (also subject responsible if other)		Nr - *No.*	
EUS/LT/A Jerry Ferr	(804) 592-5419	7/1524 KRD 103 162 Uen	
Dokansv/Godk - *Doc respons/Approved*	Kontr - *Checked*	Datum - *Date* / Rev	File
EUS/LT/A Jerry Ferr		1999-09-07 A	

PARAMETER	SPECIFICATION LIMITS	COMMENTS
Carrier Output Power (Rated)	3.0W* at high power TX 2.5W* at high power TA 1.0W* at low power TX 1.0W* at low power TA	TIA/EIA-603, par. 5.2.1, but can not exceed FCC max of +20% above rated power per Part 90.205. Able to switch between low power and high power in personality or by keypad override. * See tracking data section below for more details on set value.
Carrier Frequency Stability	± 1.50 PPM	TIA/EIA-603, par. 5.2.2. Set to +/- 1.0 PPM as received. Note: all features must function with TX & RX at opposite extremes.
Modulation Limiting	< 100% of RSD (set to +/- 90% of RSD typ.)	TIA/EIA-603, par. 5.2.3 RSD = Rated System Deviation (see System Spec)
Carrier Attack Time	< 100 mS	TIA/EIA-603, par. 5.2.4
Audio Sensitivity	11 ± 4 mVrms	TIA/EIA-603, par. 5.2.5
Audio Frequency Response	Meets Standard	TIA/EIA-603, par. 5.2.6 Use 900 MHz standard for 12.5 kHz operation.
Microphone Sub-Audible Audio Frequency Response	No CG/DCG decoder voice blocking in a receive unit.	The internal/external mic audio must be rolled off below 300 Hz to help prevent CG/DCG decoder voice blocking in a receive unit.
Audio Distortion	< 5%	TIA/EIA-603, par. 5.2.7 (spec exceeds TIA/EIA reqts)
FM Hum And Noise Ratio	> 40 dB	TIA/EIA-603, par. 5.2.8
AM Hum & Noise Ratio	> 34 dB	TIA/EIA-603, par. 5.2.9
Acoustic Mic Sensitivity	91 ± 3 dB SPL	TIA/EIA-603, par. 5.2.10
Sideband Spectrum	Meets FCC, DOC	TIA/EIA-603, par 5.2.11 and FCC Part 90.210(b)
Radiated Spurious Emissions	Meets FCC, DOC	TIA/EIA-603, par. 5.2.12 and FCC Part 90.210(d) and FCC Part 15.33(a)
Conducted Spurious Emissions	Meets FCC, DOC	TIA/EIA-603, par. 5.2.13 and FCC Part 90.210(d)
Adjacent Channel Power Ratio	800 models: > 60 dBc 900 models: > 50 dBc	TIA/EIA-603, par. 5.2.14
Audio Low Pass Filter Response	Meets Standard	TIA/EIA-603, par. 5.2.15
TX Stability Into VSWR	< -20 dBm conducted into a 6:1 VSWR load	TIA/EIA-603, par. 5.2.18, unconditionally stable at all phase angles into load, steady-state and transient
Transient Freq. Behavior Of TX	FCC 90.214	TIA/EIA-603, par. 5.2.19
Antenna Frequency Kick	< 1.0 kHz	Internal spec, measured with rated TX output power being input into antenna, “whacking” of the antenna shall not produce excessive kick
TX “Crunch” When The Case Is Repeatedly Squeezed/Released	< ± 300 Hz residual peak deviation	Degradation in TX FM Hum and Noise, internal mic disabled
CTCSS/CDCSS Mod Limiting	< 100% of RSD	TIA/EIA-603, par. 6.4.10
CTCSS/CDCSS Encode Response Time	Meets Standard	TIA/EIA-603, par. 6.4.11
CTCSS Encode Frequency	± 0.3%	TIA/EIA-603, par. 6.4.12
CTCSS Tone Distortion	< 5%	TIA/EIA-603, par. 6.4.13
CTCSS Transmitter SINAD	> 20 dB	TIA/EIA-603, par. 6.4.14
CDCSS Waveform Distortion	< 30% Droop	TIA/EIA-603, par. 6.4.15
CTCSS/CDCSS TX Hum & Noise	> 35 dB (800 models) > 30 dB (900 models)	TIA/EIA-603, par. 6.4.16
CTCSS/CDCSS Transmitter Subaudible Deviation	500-1000 Hz (800 models) 350-600 Hz (900 models)	TIA/EIA-603, par. 6.4.17

PARAMETER	SPECIFICATION LIMITS	COMMENTS
EDACS Working Channel Subaudible Deviation	500-1000 Hz (800 models) 350-600 Hz (900 models)	Similar to TIA/EIA-603, par. 6.4.17. Measure in EDACS mode, using an oscilloscope to separate the subaudible 75 Hz sine wave tone from the audible 1kHz tone.
CTCSS/CDCSS TX STE Burst	150-200 msec	TIA/EIA-603, par. 6.4.18
CDCSS/GE-STAR Mod Sense	Modulation Type A	TIA/EIA-603, par. 1.3.5.9
DTMF Encode Requirements	N/A	
GE-STAR Encode Requirements	N/A	

3. Tracking Data Settings For The Transmitter

3.1. Tracking Data for High Power (EDACS)

Set each tracking data point at 3.20W +/- 0.05W. For final test at Kukjae, the power shall measure between 3.00W and 3.40W.

3.2. Tracking Data for Low Power (EDACS)

Set each tracking data point at 1.15W +/- 0.10W. For final test at Kukjae, the power shall measure between 1.00W and 1.32W.

3.3. Tracking Data for Modulation (EDACS)

Measured with a 1kHz sine wave input, at an amplitude of 110 mVrms. (110mV is 20dB above the nominal 11 mV microphone sensitivity). In EDACS transmission, the radio automatically generates a 75 Hz subaudible channel-hold tone. An oscilloscope can be used to see the subaudible portion.

	EDACS Working Channel	
	Total Deviation	Subaudible Portion
800 MHz (normal)	4500 +/- 200 Hz	750 +/- 250 Hz
800 MHz (NPSPAC)	3600 +/- 160 Hz	600 +/- 200 Hz
900 MHz	2250 +/- 100 Hz	475 +/- 125 Hz

3.4. Tracking Data for Data Modulation (EDACS)

800 MHz (normal)	3000 +/- 300 Hz
800 MHz (NPSPAC)	2400 +/- 240 Hz
900 MHz	1500 +/- 150 Hz

3.5. Tracking Data for High Power (Talk Around)

Set each tracking data point at 2.65W +/- 0.05W. For final test at Kukjae, the power shall measure between 2.50W and 2.78W.

3.6. Tracking Data for Low Power (Talk Around)

Set each tracking data point at 1.15W +/- 0.10W. For final test at Kukjae, the power shall measure between 1.00W and 1.32W.

3.7. Tracking Data for Modulation (Talk Around)

Measured with a 1kHz sine wave input, at an amplitude of 110 mVrms. (110mV is 20dB above the nominal 11 mV microphone sensitivity).

800 MHz (normal)	4500 +/- 200 Hz
800 MHz (NPSPAC)	3600 +/- 160 Hz
900 MHz	2250 +/- 100 Hz

3.8. Tracking Data for Data Modulation (Talk Around)

Not applicable for this radio. Changing these numbers will not affect radio performance.

4. Voltage Stability (TIA/EIA)

Applies to all models and frequency splits. Measure in accordance with EIA/TIA-603. (Note: Nominal 7.5 Vdc)

SPECIFICATION	SPEC LIMIT	VOLTAGE RANGE
Carrier Output Power	3 dB DFS 6 dB DFS	± 10% ± 20%
Carrier Frequency Stability	No DFS	± 20% (exceeds TIA/EIA min. std.)
Modulation Limiting	50 – 100% RSD	± 10%
TX Audio Distortion	< 10%	± 10%
Fm Hum And Noise Ratio	No DFS	± 10%
TX Stability Into VSWR	No DFS	± 20% (exceeds TIA/EIA min. std.)
CTCSS/CDCSS Tx Mod Limiting	No DFS	± 10%
CTCSS/CDCSS Encoder Response Time	No DFS	± 10%
CTCSS Encoder Frequency	No DFS	± 10%
CTCSS Tone Distortion	No DFS	± 10%
CTCSS/CDCSS Transmitter SINAD	No DFS	± 10%
CDCSS Waveform Distortion	No DFS	± 10%
CTCSS/CDCSS TX FM Hum & Noise	No DFS	± 10%
CTCSS/CDCSS Subaudible Deviation	No DFS	± 10%
CTCSS/CDCSS STE Burst	No DFS	± 10%

5. Temperature Stability (TIA/EIA, -30°C to +60°C)

Measure in accordance with TIA/EIA-603.

SPECIFICATION	SPECIFICATION LIMITS
Carrier Output Power	3 dB DFS
Carrier Frequency Stability	No DFS
Modulation Limiting	40 – 100 % RSD
TX Audio Distortion	No DFS
FM Hum And Noise Ratio	6 dB DFS
TX Stability Into VSWR	No DFS
CTCSS/CDCSS TX Mod Limiting	No DFS
CTCSS/CDCSS Encode Response Time	No DFS
CTCSS Encode Frequency	No DFS
CTCSS Tone Distortion	No DFS
CTCSS/CDCSS Transmitter SINAD	No DFS
CDCSS Waveform Distortion	No DFS
CTCSS/CDCSS TX Hum & Noise	No DFS
CTCSS/CDCSS TX Subaudible Deviation	No DFS
CTCSS/CDCSS TX STE Burst	No DFS

6. Humidity Stability (TIA/EIA)

Measure in accordance with EIA/TIA-603 (90 - 95% R.H. @ +50°C)

SPECIFICATION	SPECIFICATION LIMITS
Carrier Output Power	3 dB DFS
Carrier Frequency Stability	No DFS
Modulation Limiting	40 – 100 % rated
Audio Distortion	No DFS
Fm Hum And Noise Ratio	6 dB DFS
CTCSS/CDCSS TX Mod Limiting	No DFS
CTCSS/CDCSS Encoder Response Time	No DFS
CTCSS Encoder Frequency	No DFS
CDCSS Waveform Distortion	No DFS
CTCSS/CDCSS TX FM Hum & Noise	No DFS
CTCSS/CDCSS TX Subaudible Deviation	No DFS
CTCSS/CDCSS STE Burst	No DFS

7. Vibration Stability (TIA/EIA)

Measure in accordance with EIA/TIA-603. The radio (including battery) must meet all specifications of section 2.0 after vibration per this standard. In addition, the unit must pass the following specifications during vibration.

SPECIFICATION	SPECIFICATION LIMITS
Reference Sensitivity	No DFS
Carrier Output Power	No DFS
Carrier Frequency Stability	No DFS
Modulation Limiting	50 – 100 % RSD
FM Hum And Noise Ratio	15 dB DFS, but in no case worse than 25 dB FM Hum and Noise Ratio (NOTE: This is necessary to ensure proper CG / DCG operation) [exceeds TIA/EIA minimum requirements]
CTCSS/CDCSS TX Mod Limiting	No DFS

8. Vibration Stability (USFS)

Measure in accordance with United States Forest Service (USFS) Vibration Standard, para. 8.11. The radio (including battery) must meet all specifications of section 2.0 after vibration per this standard. In addition, the unit must pass the following specifications during vibration.

SPECIFICATION	SPECIFICATION LIMITS
Reference Sensitivity	No DFS
Carrier Output Power	No DFS
Carrier Frequency Stability	No DFS
Modulation Limiting	50 – 100 % RSD
FM Hum And Noise Ratio	15 dB DFS
CTCSS/CDCSS TX Mod Limiting	No DFS

9. Shock Stability (TIA/EIA)

Measure in accordance with EIA/TIA-603. The equipment shall suffer no more than superficial mechanical damage and shall meet the requirements as specified in section 2.0 without degradation after being shocked per this standard.

10. Military Standards

The applicable requirements of MIL-STD-810E are elaborated in the “Environmental Test Plan” referenced above and incorporated herein by reference.

11. No Transmission Off-Frequency

To prevent accidental transmissions off-frequency, the transmitter shall meet the carrier frequency stability requirements referenced herein, under any and all combinations of temperature, humidity, and other environmental extremes encountered in normal operation, for any applied supply voltage from 0.0V to 13.5V.

12. Revision History

Revision	Date	Revised By	Reason for Change
A	9/7/1999	J. Ferr	Initial release of specification. Includes updates Table 2 to add spec for EDACS working channel subaudible deviation. Major re-write of Section 3 to specify all tracking data settings for the transmitter.
PA2	7/12/1999	J. Ferr	Substantial changes to incorporate supplier and marketing inputs
PA1	6/12/1999	J. Ferr	First Draft

A2: PRODUCT SPECIFICATION

(RECEIVER)

Uppgjord (även faktaansvarig om annan) - Prepared (also subject responsible if other)		Nr - *No.*		
EUS/LT/A Jerry Ferr (804) 592-5419		8/1524 KRD 103 162 Uen		
Dokansv/Godk - *Doc respons/Approved*	Kontr - *Checked*	Datum - *Date*	Rev	File
EUS/LT/A Jerry Ferr		1999-09-07	A	

RECEIVER SPECIFICATIONS

LOW TIER EDACS PORTABLE RADIOS

1. Scope

These are the receiver specifications for the EH-8031 portable radios designed and manufactured for Ericsson Inc. The radios must meet these specifications at any frequency within the frequency split without any re-tuning.

1.1. Reference Drawings and Specifications

This document is one of a series of documents describing requirements for this transceiver, and is not a stand-alone specification. Additional requirements for this radio appear in many different documents. A complete list of all documents describing requirements for this transceiver, as well as a complete list of reference documents, is included in the following document:

ERICSSON PRODUCT SPECIFICATION (DOCUMENT NUMBER: 1301 KRD 103 162 Uen)

1.2. Definitions and Abbreviations

See product specification.

2. Specifications at Standard Test Conditions

PARAMETER	SPECIFICATION LIMIT	COMMENTS
Rated Audio Output Power	0.5 W	
Speaker Impedance	16 ohms	Applies to internal & external speakers
Radiated Spurious Emissions	Meets FCC part 15 and Canadian requirements	FCC: See TIA/EIA-603, par. 5.1.1 (including 5.1.1.3), but replace "1000 MHz" in 5.1.1.3 with the higher of 1000 MHz or the max. frequency specified in FCC part 15.33 (b) (3).
Conducted Spurious Emissions	-57 dBm	TIA/EIA-603, par. 5.1.2 FCC Part 15.111(a) FCC Part 15.33(c)
Reference Sensitivity	< 0.35 uV	TIA/EIA-603, par. 5.1.4 At 12dB SINAD
Signal Displacement Bandwidth	> 40% of RSD	TIA/EIA-603, par. 5.1.5
Adjacent Channel Rejection	800 models > 65 dB (at 25 kHz) 900 models > 55 dB (at 12.5 kHz)	TIA/EIA-603, par. 5.1.6 (Spec exceeds TIA/EIA reqts)
Offset Channel Selectivity	> 20 dB	TIA/EIA-603, par. 5.1.7 Applies to NPSPAC only
Spurious Response Rejection	> 60 dB	TIA/EIA-603, par. 5.1.8
Intermodulation Rejection	> 65 dB	TIA/EIA-603, par. 5.1.9 (Spec exceeds TIA/EIA reqts)
Audio Frequency Response	Meets standard	TIA/EIA- 603, par. 5.1.10
Hum And Noise Ratio	Unsquelched > 40 dB Squelched -57 dBW	TIA/EIA- 603, par. 5.1.11
Audio Distortion	< 5% at rated audio power and 17dB below. <15% with volume set to "maximum".	TIA/EIA- 603, par. 5.1.12 (Spec exceeds TIA/EIA reqts)
Audio Squelch Sensitivity	7.0-10.0 dB SINAD	TIA/EIA- 603, par. 5.1.13 (Spec exceeds TIA/EIA reqts)
Squelch Blocking	Meets standard	TIA/EIA- 603, par. 5.1.14
Squelch Hysteresis	1.5 to 3.0 dB difference in RF signal levels.	The squelch circuit shall have sufficient hysteresis to prevent toggling open/shut during normal operation.
Receiver Attack Time	< 150 mS	TIA/EIA- 603, par. 5.1.15
Receiver Closing Time	< 250 mS	TIA/EIA- 603, par. 5.1.16
Rx Audio Sensitivity	< 40% of RSD	TIA/EIA- 603, par. 5.1.17
Impulse Blanking Effectiveness	N/A	TIA/EIA- 603, par. 5.1.18
Average Radiation Sensitivity	-89 dBm	TIA/EIA- 603, par. 5.1.19
Acoustic Audio Output	Meets standard	TIA/EIA- 603, par. 5.1.20
Rx Self-Quieters	No discernable "beat" tones to be heard	
DTMF Side Tone Level at Speaker	20 mW (nominal)	
CTCSS / CDCSS Squelch Opening SINAD	Meets standard	TIA/EIA- 603, par. 6.4.1
CTCSS Rx Audio Attack Time	Meets standard	TIA/EIA- 603, par. 6.4.2
CDCSS Rx Audio Attack Time	< 350 mS	TIA/EIA- 603, par. 6.4.2
CTCSS / CDCSS Audio Closing Time	< 250 mS	TIA/EIA- 603, par. 6.4.3

PARAMETER	SPECIFICATION LIMIT	COMMENTS
CTCSS Rx Audio Attack Time W/ RF Carrier Frequency Offset	Meets standard	TIA/EIA- 603, par. 6.4.4
CDCSS Rx Audio Attack Time W/ RF Carrier Frequency Offset	< 350 mS @ 100 Hz	TIA/EIA- 603, par. 6.4.4
CTCSS/CDCSS Rx Fm Hum & Noise	> 30 dB	TIA/EIA- 603, par. 6.4.5
CTCSS Decoder Response BW	Meets standard	TIA/EIA- 603, par. 6.4.6
False Rate Response	< 1 false / 30 minutes	TIA/EIA- 603, par. 6.4.7
Receiver Audio Response	Meets standard	TIA/EIA- 603, par. 6.4.8
Squelch Tail Elimination	< 50 msec	TIA/EIA- 603, par. 6.4.9
Voice Blocking Of CTCSS/ CDCSS Decoder.	No blocking will be heard when talking loudly or blowing into the companion transmitter	The companion transmitter voice deviation (without CG/DCG) shall be within 75 ± 5 % of RSD, with CG/DCG deviation set at a nominal 15 % of RSD. (Exceeds TIA / EIA 603 requirements)

3. Tracking Data Settings For The Receiver

3.1. Tracking data for squelch

The squelch shall be set to open (go from being muted, to providing an audio output) at a SINAD of between 7.0 dB and 10.0 dB.

Once the squelch has opened, hysteresis shall be set so that it closes (radio mutes) at an RF signal that is 1.5 to 3.0 dB below the squelch opening level.

4. Voltage Stability (TIA/EIA)

Measure in accordance with EIA/TIA-603 (Note: Nominal 7.5 Vdc)

SPECIFICATION	SPECIFICATION LIMIT	VOLTAGE RANGE
Reference Sensitivity	3 dB DFS	± 20%
Signal Displacement Bandwidth	no DFS	± 10%
Adjacent Channel Rejection	6 dB DFS	± 10%
Offset Channel Selectivity	No DFS	± 10%
Spurious Response Rejection	no DFS	± 10%
Intermodulation Rejection	3 dB DFS	± 10%
FM Hum And Noise Ratio	3 dB DFS	± 10%
RX Audio Distortion	< 10% @ -17 dB	± 20%
Audio Squelch Sensitivity	< 12dB SINAD	± 10% & ± 20%
Squelch Blocking	No DFS	± 10%
Audio Sensitivity	< 40% of RSD @ 1/2 rated power	± 10%
CTCSS Squelch Opening SINAD	3 dB DFS	± 10%
CDCSS Squelch Opening SINAD	3 dB DFS	± 10%
CTCSS RX Audio Attack Time	Twice the standard	± 10%
CDCSS RX Audio Attack Time	Twice the standard	± 10%
CTCSS/CDCSS RX Audio Closing Time	< 500 mS	± 10%
CTCSS RX Audio Attack Time W/ RF Carrier Frequency Offset	twice the standard	± 10%
CDCSS RX Audio Attack Time W/ RF Carrier Frequency Offset	twice the standard	± 10%
CTCSS/CDCSS RX FM Hum & Noise	no DFS	± 10%
CTCSS Decoder Response BW	no DFS	± 10%
False Response Rate	no DFS	± 10%
Squelch Tail Elimination	no DFS	± 10%
Voice Blocking Of CTCSS/ CDCSS Decoder.	no DFS (exceeds TIA/EIA specification)	± 10%

5. Temperature Stability (TIA/EIA, -30°C to +60°C)

Measure in accordance with TIA/EIA-603

TEST PARAMETER	Specification Limit
Reference Sensitivity	6 dB DFS
Signal Displacement BW	> 20% RSD
Adjacent Channel Rejection	12 dB DFS
Offset Channel Selectivity	10 dB DFS
Spurious Response Rejection	10 dB DFS
Intermodulation Rejection	6 dB DFS
Hum And Noise Ratio	10 dB DFS
RX Audio Distortion	< 10% @ -17 dB
Audio Squelch Sensitivity	< 12dB SINAD
Squelch Blocking	no DFS
RX Audio Sensitivity	< 60% @ 1/2 rated pwr
CTCSS Squelch Opening SINAD	3 dB DFS
CDCSS Squelch Opening SINAD	3 dB DFS

TEST PARAMETER	Specification Limit
CTCSS RX Audio Attack Time	twice the standard
CDCSS RX Audio Attack Time	twice the standard
CTCSS/CDCSS Audio Closing Time	< 500 mS
CTCSS RX Audio Attack Time W/ RF Carrier Frequency Offset	twice the standard
CDCSS RX Audio Attack Time W/ RF Carrier Frequency Offset	twice the standard
CTCSS/CDCSS Hum & Noise Ratio	no DFS
CTCSS Decoder Response BW	no DFS
False Response Rate	no DFS
Squelch Tail Elimination	no DFS
Voice Blocking Of CTCSS/ CDCSS Decoder. (exceeds TIA/EIA specification)	no DFS

6. Humidity Stability (TIA/EIA)

Measure in accordance with EIA/TIA-603 (90 - 95% R.H. @ +50°C)

TEST PARAMETER	SPECIFICATION LIMIT
Reference Sensitivity	10 dB DFS
Signal Displacement BW	> 20% of RSD
Adjacent Channel Rejection	12 dB DFS
Offset Channel Selectivity	10 dB DFS
Spurious Response Rejection	10 dB DFS
Intermodulation Rejection	6 dB DFS
FM Hum & Noise Ratio	10 dB DFS
RX Audio Distortion	< 10% @ -17 dB
Audio Squelch Sensitivity	< 12dB SINAD
Squelch Blocking	no DFS
Audio Sensitivity	< 60% @ 1/2 rated power
CTCSS Squelch Opening SINAD	3 dB DFS
CDCSS Squelch Opening SINAD	3 dB DFS
CTCSS Audio Attack Time	twice the standard
CDCSS Audio Attack Time	twice the standard
CTCSS/CDCSS Audio Closing Time	< 500 mS
CTCSS Rx Audio Attack Time W/ RF Carrier Frequency Offset	twice the standard
CDCSS Rx Audio Attack Time W/ RF Carrier Frequency Offset	twice the standard
CTCSS/CDCSS Hum & Noise Ratio	no DFS
CTCSS Decoder Response BW	no DFS
Squelch Tail Elimination	no DFS
Voice Blocking Of CTCSS/ CDCSS Decoder (exceeds TIA/EIA specification)	no DFS

7. Vibration Stability (TIA/EIA)

Measure in accordance with EIA/TIA-603. The radio (including battery) must meet all specifications of section 2.0 after vibration per this standard. In addition, the unit must pass the following specifications during vibration.

TEST PARAMETER	SPECIFICATION LIMIT
Reference Sensitivity	no DFS
CTCSS/CDCSS Opening SINAD	3 dB DFS

8. Vibration Stability (USFS)

Measure in accordance with United States Forest Service (USFS) Vibration Standard, para. 8.11. The radio (including battery) must meet all specifications of section 2.0 after vibration per this standard. In addition, the unit must pass the following specifications during vibration.

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EUS/LT/A Jerry Ferr		1999-09-07	A	

TEST PARAMETER	SPECIFICATION LIMIT
Reference Sensitivity	no DFS
CTCSS/CDCSS Opening SINAD	3 dB DFS

9. Shock Stability (TIA/EIA)

Measure in accordance with EIA/TIA-603. The equipment shall suffer no more than superficial mechanical damage and shall meet the requirements as specified in section 2.0 without degradation after being shocked per this standard.

10. Military Standards

The applicable requirements of MIL-STD-810E are elaborated in the “Environmental Test Plan” referenced above and incorporated herein by reference.

11. Revision History

Revision	Date	Revised By	Reason for Change
A	9/7/1999	J. Ferr	Initial release of specification. Added section 3 (tracking data settings for squelch). In table 2, tightened spec for audio squelch sensitivity under nominal conditions, and clarified squelch hysteresis. Updated sections 4, 5, and 6 to retain original looser spec under environmental conditions.
PA3	8/11/1999	J. Ferr	Changes to section 2.0 to add details for squelch hysteresis requirement, and to add requirement that speaker impedance be 16 ohms.
PA2	7/12/1999	J. Ferr	Substantial changes to incorporate supplier and marketing inputs
PA1	6/12/1999	J. Ferr	First Draft

A3: PRODUCT SPECIFICATION (SYSTEM)

Uppgjord (även faktaansvarig om annan) - Prepared (also subject responsible if other)		Nr - *No.*		
EUS/LT/A Jerry Ferr (804) 592-5419		9/1524 KRD 103 162 Uen		
Dokansv/Godk - *Doc respons/Approved*	Kontr - *Checked*	Datum - *Date*	Rev	File
EUS/LT/A Jerry Ferr		1999-09-01	A	

SYSTEM SPECIFICATIONS

LOW TIER EDACS PORTABLE RADIOS

1.0 Scope

These are the system specifications for the EH-8031 portable radios designed and manufactured for Ericsson Inc. The radio must meet these specifications at any frequency within the frequency split without any re-tuning.

1.1 Reference Drawings and Specifications

This document is one of a series of documents describing requirements for this transceiver, and is not a stand-alone specification. Additional requirements for this radio appear in many different documents. A complete list of all documents describing requirements for this transceiver, as well as a complete list of reference documents, is included in the following document:

ERICSSON PRODUCT SPECIFICATION (DOCUMENT NUMBER: 1301 KRD 103 162 Uen)

1.2 Definitions and Abbreviations

See product specification.

2.0 General Specifications

Note: Performance limits under this section apply under standard as well as all extreme conditions, separate or combined.

Specification	Model		Limit or Value	Comments/Standards
	800	900		
Frequency Range (MHz)	√		TX: 806-824 EDACS TX: 851-869 Talkaround RX: 851-869 EDACS and Talkaround	No tuning is required to change frequency.
Channel Spacing	√		25 kHz 12.5 kHz (NPSPAC)	NPSPAC operation is supported and is optionally enabled through the personality.
Channel Bandwidth	√		25 kHz	
Frequency Range (MHz)		√	TX: 896-902 EDACS TX: 935-941 Talkaround RX: 935-941 EDACS and Talkaround	No tuning is required to change frequency.
Channel Spacing		√	12.5 kHz	
Channel Bandwidth		√	12.5 kHz	
Antenna Input Impedance	√	√	50 Ohms	Over Full Frequency Band Note: RF performance of radio measured at BNC adapter fitted to radio antenna connector.
Rated System Deviation (RSD)	√		±5.0 kHz (+/- 4.0 kHz NPSPAC)	Max. Allowable deviation under any conditions, voice plus all other modulation (CTCSS, etc.) TIA 603 Section 1.3.4.4
Rated System Deviation (RSD)		√	±2.5 kHz	Max. Allowable deviation under any conditions, voice plus all other modulation (CTCSS, etc.) TIA 603 Section 1.3.4.4

Specification	Model		Limit or Value	Comments/Standards
	800	900		
Nominal Deviation	√	√	90% of RSD	Set with voice only, at all tracking data frequencies
	√	√	90% of RSD	Set with voice and TCG / DCG, at all tracking data frequencies.
	√	√	60 ± 6 % of RSD (no pre-emphasis on either encode signal)	DTMF & G-STAR Deviation
Deviation Variation Across Split	√	√	85% - 95% of RSD	Measured both with and without TCG / DCG
Deviation Symmetry	√	√	< 0.3 kHz	Measured both with and without TCG / DCG
Standard test modulation (audio)	√	√	± 60% of rated system deviation	
Modulation Type	√	√	Audio: FM type F3	
Rated duty cycle	√	√	10 / 10 / 80	TIA/EIA 603 Section 1.3.2.3
DC Supply Voltage Susceptibility	√	√	Meets standards	TIA/EIA-603, par. 5.3.6
Battery Life	√	√	Meets standards (see battery life section of this document)	TIA/EIA-603, par. 5.3.7
Dimensions	√	√	Meets standards (see product specification)	TIA/EIA-603, par. 5.3.8
Weight	√	√	Meets standards (see product specification)	TIA/EIA-603, par. 5.3.9
Transmit Time	√	√	30 minutes continuous at high power, using battery eliminator	Without permanent damage or overheating.
Receive Time	√	√	12 hours continuous at maximum audio output, using battery eliminator	Without permanent damage or overheating.
Temperature Range	√	√	WITH NiCd BATTERIES -30°C to +60°C Operating -40°C to +70°C Storage WITH NiMH BATTERIES -10°C to +45°C Operating -20°C to +30°C Long Term Storage	At temperature extremes, the radio shall remain operable, and all controls will function. The LCD response time at minus 30°C shall be less than 5 sec. NiMH battery stored above +30°C for 90 days will gradually lose capacity.
Fusing	√	√	See design guidelines	
Lock Detect and TX disable	√	√	Automatically disables transmit if synthesizer loses lock	

3.0 Electrical Design & Performance Requirements

3.1 Hardware Timing Requirements

Parameter	Description	Requirement	Notes
T_{SLRR}	Synthesizer lock time (receive to receive)	5 msec max	Measured from synthesizer enable to phase locked with frequency offset <500 Hz
T_{SLRT}	Frequency kick: Synthesizer lock time (receive to transmit)	15 msec max	Measured from synthesizer enable to phase locked with frequency offset <500 Hz
T_{SLTR}	Synthesizer lock time (transmit to receive)	15 msec max	Measured from synthesizer enable to phase locked with frequency offset <500 Hz

Uppgjord (även faktaansvarig om annan) - Prepared (also subject responsible if other)		Nr - *No.*		
EUS/LT/A Jerry Ferr (804) 592-5419		9/1524 KRD 103 162 Uen		
Dokansv/Godk - *Doc respons/Approved*	Kontr - *Checked*	Datum - *Date*	Rev	File
EUS/LT/A Jerry Ferr		1999-09-01	A	

3.2 EDACS Radio Timing Requirements

The following requirements include hardware plus software

Parameter	Description	Requirement	Notes
T_{FS}	Fast Squelch Attack Time	10 msec max	Provides a quick indication of whether a channel has any RF carrier activity. Allows approx. 6msec for hardware detection and 4msec for software to integrate the signal. During scan, at the end of this time, software decides to either stay on channel, due to the squelch indicating a carrier might be present, or go to the next channel in the scan list.
T_{SS}	Slow Squelch Attack Time	120 msec max	Provides more confidence that carrier is present before radio squelch is actually opened.
T_{TCG}	Tone Channel Guard Attack Time	400 msec max	Approx 120 to 375 msec depending on tone frequency
T_{DCG}	Digital Channel Guard Attack Time	400 msec max	Approx. 270 msec typ in good signaling. 400 msec allows for poor signaling.
T_{SD}	Scan Duration (= T_{SLRR} + T_{FS})	15 msec max	
T_{AS}	Audio Settling Time	10 msec max	??? not well defined
T_{M}	Priority Sample Mute Time	30 msec max	Length of time the audio is muted during a priority scan. If much longer than 30 msec, the user would hear “pops” during priority scan.
T_{P1}	Priority 1 and 2 Scan Time	At least 2X per second each; at least 4X per second if only P1 or P2 is being used.	But if CG is enabled (resulting in longer scan times), the scan rate shall be decreased below these levels to avoid muting the audio more than 10% of the time.
	EDACS Slot timing	4.8: 10.83 ± 0.2 ms 9.6: 15.60 ± 0.1 ms	Ref: 350A1550 EDACS Trunking Air Interface Spec

3.3 Digital Channel Guard Codewords

104 codes (83 standard codewords per TIA/EIA-603, par. 1.3.5.7) plus 21 Ericsson codewords..

3.4 DC Supply Characteristics

3.4.1 Voltage and Overvoltage Characteristics

Supply Voltage Range	7.5 V nominal 6.0 V – 9.0 V operating 0.0 V – 11.8 V continuous without damage to radio 11.5 V – 13.5 V intermittent (up to 10 seconds max.) without damage to radio	• The high voltage levels can occur during rapid charge of the battery packs, and when radio is initially installed on battery charger. • Requirements apply in any mode of operation (receive, transmit, or standby).

3.4.2 Battery life (Min.Hours)

The battery life shall equal or exceed 8 hours, when measured under the following conditions:

- Duty cycle: 10% transmit at high power, 10% receive rated audio, 80% standby
- Measure per TIA/EIA-603, par. 1.3.2.3
- Use the highest capacity battery offered for sale by Ericsson

3.4.3 Maximum current drain

Operational Mode	Requirement
Off	< 2 mA
Standby	< 85 mA
Receive rated audio	< 250 mA
Transmit (High Power)	< 1500 mA
Talkaround (High Power)	< 1500 mA
Transmit or Talkaround (Low power)	< 900 mA

3.4.4 Low Voltage Indication, Transmit Inhibit, and automatic shutdown

If the battery falls below the Low Battery Warning Level stored in the tracking data (approx. 6.4V +/- 0.1 V), the low battery alert tone is sounded and a low battery display activated. The battery level must rise a fixed amount (hard coded hysteresis to be determined after hardware design is complete) above that amount to reset the low battery warning (turn off the indicator and restore normal display if within display timeout period).

If while the PTT button is pressed, the battery voltage drops below the Low Battery TX level stored in personality (approx. 5.9V +/- 0.1V), transmit operation will be disabled until the battery voltage rises above the Low Battery Warning Level by the hard coded hysteresis level to allow transmissions to resume. (Note: the Low Battery Icon should be “on” indicating the warning level was passed through, if not, activate it).

If while the PTT button is not pressed, the battery level drops below the low voltage shut off level stored in the tracking data (5.9 +/- 0.1 V), the radio will bypass the power switch and shut down the radio. This is necessary to prevent damage to Nickel Metal Hydride batteries caused by deep discharge.

3.5 Microprocessor Frequency Shift

To avoid having harmonics of the microprocessor interfere with radio RF operation, there shall be facility to shift the microprocessor XTAL frequency on a channel-by-channel basis (in the personality) for *both TX & RX channels*. There shall be at least 2 states at each frequency.

4.0 Mechanical Design Requirements

4.1 Radio Controls and Antenna Interface

The antenna and the mating radio threads must withstand an assembly torque of 0.173 kg-m (15 in-lbs).

The antenna and the mating radio threads must withstand an axial tensile load of 27 kgs (60 lbs.), and an axial compressive load of 5.4 kgs (12 lbs.), for 30 seconds, applied through the mating antenna stud.

The radio antenna mounting threads must withstand 300 engagement and disengagement cycles with the mating antenna stud and not degrade the above torque measurements by more than 50%.

The rotary volume and channel select controls shall withstand 500,000 full travel operation cycles. (This includes operation of the On/Off switch). The power switch should have a 250 mA load during cycle testing. The channel select switch is to be tested with no load.

The rotary volume and channel select switch should withstand a 0.057 kg-m (5 in-lb.) torque in the clockwise and counter-clockwise direction.

Push buttons must withstand 100,000 full travel operation cycles, except for PTT (see below) which is more stringent.

All radio controls must withstand an axial tensile load of 4.53 kgs (10 lbs.) for 30 seconds applied perpendicularly to the top plane of the radio.

All radio controls must withstand an axial compressive load of 10.87 kgs (24 lbs.) applied perpendicularly to the top plane of the radio.

All radio controls must withstand a side load of 6.79 kgs (15 lbs.) in each of the directions perpendicular to the four sides of the radio when viewed from the top. The load is applied at the midpoint of the control above the escutcheon surface.

The push-to-talk assembly must withstand 500,000 full travel operation cycles.

The push-to-talk assembly shall be of sufficient stiffness and constructed in such a way as to prevent the radio from being keyed when the radio plus battery is allowed to lie on a 6.35 mm (0.250 in) diameter rod, which is resting horizontally on a smooth surface. The rod shall contact the push-to-talk area at its midpoint, with the rod axis perpendicular to the length of the radio.

The PTT switch must have distinct tactile feel when pressed and released. Pressing anywhere on the PTT switch with normal force shall result in PTT operation.

4.2 Grille And Speaker Assembly

The grille must withstand a compressive force of 33.97 kgs (75 lbs.) applied over a 25.4 mm (1 in.) diameter area without failure of the grille or damage to the speaker or its mounting hardware.

4.3 Contact Plating

All internal and external connectors should be plated as necessary to avoid corrosion under environmental extremes. Gold plating of an appropriate thickness, over a suitable under plating, is desirable for external contact due to it's resistance to corrosion. Connectors include:

Internal connectors

UDC connectors

Battery connectors

4.4 Screws

All external screws to have metric threads with TORX(r) heads. (TORX (r) is a registered trademark of Camcar/Textron, Inc.) Internal screws may have either Phillips or TORX(r) heads. External screws shall be plated as needed to meet industrial design and corrosion requirements.

Screw lengths and head sizes shall be standardized so a minimum of different lengths and drivers are used.

5.0 Revision History

Revision	Date	Revised By	Reason for Change
A	9/1/1999	J. Ferr	Initial release of specification. Includes updates to section 3.2 (battery life).
PA3	8/11/1999	J. Ferr	Updated DC current (section 3.4.3) to relax spec in standby mode from 70 mA to 85 mA.
PA2	7/12/1999	J. Ferr	Substantial changes to incorporate supplier and marketing inputs.
PA1	9/30/1998	J. Ferr	First Draft.

A4: PRODUCT SPECIFICATION

Uppgjord (även faktaansvarig om annan) - Prepared (also subject responsible if other)		Nr - *No.*	
EUS/LT/A Jerry Ferr	(804) 592-5419	1301 KRD 103 162 Uen	
Dokansv/Godk - *Doc respons/Approved* / Kontr - *Checked*		Datum - *Date* / Rev	File
EUS/LT/A Jerry Ferr		1999-09-07 A	

PRODUCT SPECIFICATION

LOW TIER EDACS PORTABLE RADIOS

1. Overview

1.1. Ericsson and Kukjae Relationship

This radio is built by Kukjae in Korea, and is intended for worldwide sale exclusively by Ericsson US, unless otherwise stated in the applicable business agreement or contract. The hardware is provided by Kukjae, and is heavily based on the existing PCS radio provided by Kukjae to Ericsson. The software is based on the PCS software developed by Ericsson and also used in the MDX and other Ericsson radios. The intent is that Kukjae and Ericsson will cooperate to share responsibility for any required minor software modifications.

1.2. EDACS Compatible, Conventional Capability

These radios are compatible with EDACS, and are primarily intended to be used as EDACS radios. The do however have limited conventional communications capability, in the talk-around band.

1.3. Regulatory Requirements

This transceiver must meet all applicable requirements of the following:
FCC part 15, FCC part 90, Industry Canada, Factory Mutual, CSA, CE.

While every effort has been made to incorporate the details of these requirements into these specifications, ***it is the supplier's responsibility*** to verify that the transceiver meets the regulatory requirements listed above, regardless of whether or not the specific technical requirements are delineated in the Ericsson specifications.

1.4. Definitions and Abbreviations

TCG = Tone Channel Guard
DCG = Digital Channel Guard
CG = Channel Guard (generic term, includes TCG and DCG)
DFS = Degradation from specification value at standard conditions
RSD = Rated system deviation (or system deviation) = peak deviation (voice + data)

1.5. TMS, HMS, and Golden Sample Requirements

1.5.1. HMS – Hand Made Samples

HMS or hand made samples represent the first engineering "proof of concept" prototypes of a new design. They may include, for example, hand soldered components, hand machined mechanical housings, etc. The are expected to meet specifications under nominal environmental & voltage conditions only, and may not function under extreme environmental conditions.

1.5.1.1. Required Data and documentation

HMS samples shall ship with complete electrical test data at room temperature, along with a schematic diagram and assembly drawing to help locate parts. HMS samples provided with incomplete or missing data will be rejected by EUS and returned to the supplier without evaluation.

Uppgjord (även faktaansvarig om annan) - Prepared (also subject responsible if other)		Nr - *No.*	
EUS/LT/A Jerry Ferr (804) 592-5419		1301 KRD 103 162 Uen	
Dokansv/Godk - *Doc respons/Approved*	Kontr - *Checked*	Datum - *Date* / Rev	File
EUS/LT/A Jerry Ferr		1999-09-07 A	

1.5.2. TMS – Tool Made Samples

TMS or tool made samples are intended to be fully representative of production hardware, software, and packaging. They should arrive at Ericsson fully packaged and with all documentation that would normally be included with production hardware. This will enable Ericsson to approve of not only the radios, but also the method of packing, documentation, etc.

TMS samples are expected to meet any and all specifications, including testing at environmental and voltage extremes.

The first revision of TMS hardware will be designated as "TMS1". If changes are necessary, the 2nd revision of the design shall be designated "TMS2", etc.

1.5.2.1. Required Data and documentation

In addition to all the documentation normally included with production hardware, TMS samples shall ship with complete, serialized test data taken at room temperature on all samples, and complete test data taken over temperature and environmental conditions on a sample as mutually agreed by the supplier and Ericsson.

The following must also be included with the shipment of TMS samples: A complete and accurate parts list (Excel or PDF format), schematic diagram (DXF or PDF format), board layout (DXF or PDF format), and written theory of operation (Word or PDF format). These documents are provided to facilitate the following activities: electrical and mechanical evaluation, FCC filing, and generation of Ericsson maintenance manuals.

TMS samples provided with incomplete or missing data and documentation will be rejected by EUS and returned to the supplier without evaluation.

1.5.3. Reference "Golden" Sample

A mutually approved, final revision TMS sample shall be kept as the standard for inspection of all items (mechanical, electrical, appearance, workmanship, software, etc.) not specified on this drawing.

1.6. Ultimate Responsibility Remains with the Supplier

It is the complete, ultimate, and sole responsibility of the supplier to select hardware and software techniques that will make the product meet all of the required technical specifications. Ericsson may provide technical assistance and implementation suggestions, based upon our experience with similar radio products. However, the supplier is acting in the capacity of an independent contractor and any assistance, recommendations, or technical guidance provided by Ericsson shall not relieve the supplier of the ultimate responsibility for meeting all specifications.

2. Reference Documents

2.1. General Standards

The following standards apply **to the extent referenced herein**.

CE (European Common Market Safety Requirement)	ETS 300 279
EIA/TIA standard	TIA/EIA-603
Military standard	MIL-STD-810-E
FCC Standards	CFR Title 47, Parts 15, 90
DOC Standard	RSS-119
U.S.F.S. Vibration Standard	Minimum Standard Equipment for Land Mobile FM Communications Equipment, U.S. Dept. of Agriculture, Forest Service
Ericsson corporate standard for product marking	102 01-101 Uen
Ericsson standard for package marking	151 91-105 Uen

2.2. Product Specific Requirements

Requirements for this product are delineated in the following documents, all of which are incorporated herein by reference. **The radio must meet all requirements appearing in all of these documents**.

Document Survey	1095 KRD 103 162 Uen
Product Specification	1301 KRD 103 162 Uen
UDC Specification	1/1524 KRD 103 162 Uen
Qualification Test Plan	3/1524 KRD 103 162 Uen
Transmitter Specification	7/1524 KRD 103 162 Uen
Receiver Specification	8/1524 KRD 103 162 Uen
System Specification	9/1524 KRD 103 162 Uen
Environmental Test Per MIL-STD	12/1524 KRD 103 162 Uen

3. Feature Set

3.1. Note on Feature Encryption

In order to simplify manufacturing and reduce production cost, marketing has decided to eliminate feature encryption for this product. All radios will ship with 128 system/group sets and all required features activated on every radio.

3.2. Table of Features

FEATURE	DETAILS	MODEL		NOTES
		800	900	
EDACS Systems and Groups	128	√	√	128 total (systems + groups). 16 systems or groups per bank.
Conventional DTMF signaling		√	√	Through keypad. For system models only.
Emergency/Home		√	√	EDACS
Keypad lock		√	√	System models only
Power up system/group		√	√	EDACS
Manual individual calls		√	√	EDACS, system models only
Manual telephone interconnect		√	√	EDACS, system models only
Store and Recall		√	√	EDACS, system models only
Recall last caller		√	√	EDACS, system models only
Group scan		√	√	EDACS
Automatic login		√	√	EDACS
Conventional failsoft		√	√	
SCAT		√	√	EDACS
Priority System Scan		√	√	EDACS
Wide Area Scan		√	√	EDACS
Dynamic Regrouping				Not supported
Battery Life		√	√	See System Specification
Channel Guard (CTCSS)	Conventional	√	√	With and without Squelch Tail Elimination (STE). Standard tones from 67.0 – 210.7 Hz per TIA/EIA 603 section 1.3.5.2. Note: Standard tones from 218.1 to 250.3 are NOT supported.
Digital Channel Guard (CDCSS)	Conventional	√	√	With Squelch Tail Elimination (STE)
Personality Programming (Using PC Programmer)		√	√	
Low battery warning and shutoff		√	√	See system spec for details.
TX / BUSY Indication		√	√	Through icons on LCD display.
Display – Numeric models	Required Now	√	√	4 numeric characters, plus icons for service, no service, scan, sys, grp, transmit, busy, special.
Display – Alphanumeric models	Future New Product	√	√	Display similar to 19B801594 Driver to be PCF8576C
Accessory connector		√	√	The UDC connector shall have an orientation tab sufficient to positively prevent accidentally installing it in the wrong orientation.
Busy Channel Lockout		√	√	Disables transmit on a busy channel. Set on/off per channel in radio personality
Carrier Control Timer (limits continuous transmit time)		√	√	Programmable from 10 to 150 seconds with 10 second increments. Setting to 0 in personality disables and allows unlimited transmit time.
GE-STAR encode		TBD	TBD	ANI and Emergency.
GE-STAR decode		TBD	TBD	With decode, radio supports Enhanced GE Star selective signaling.
GE-MARC		NO	NO	Not supported
DTMF Keypad with Back-lit Keys		√	√	For DTMF model only. Generates DTMF tones over the air.

FEATURE	DETAILS	MODEL		NOTES
		800	900	
Intrinsically Safe Option		√	√	Must be certified by Factory Mutual and CSA. (See Factory Mutual publication entitled LOSS PREVENTION DATA, dated September 1976). • Intrinsically safe: Class I, II, III, Division 1, Groups C, D, E, F, G. • Non-incendive: Class I, Division 2, Groups A, B, C, D Related Factory Mutual bulletins that describe testing and technical requirements are standards 3600, 3610, 3611.
Volume Control		√	√	Directly controlled by analog audio taper potentiometer. No display of volume level.

4. Reliability and Quality

4.1. Qualification Test Plan

The Qualification Test Plan (Ericsson document number 3/1524 KRD 103 162 Uen) documents those activities that the supplier must perform in order to provide Ericsson with a reasonable level of assurance that the radios meet all specification requirements.

However, mutual acceptance of this test plan does not relieve the supplier from responsibility to ensure that the radios are "fit for use".

4.2. Environmental Endurance

This product must meet the applicable environmental specifications of MIL-STD-810-E as detailed in the referenced Environmental Test specification. This product must also meet the applicable environmental specifications of other referenced specifications (TIA603, ETS, etc.), as detailed in the referenced specs.

4.3. Mean Time Between Failures (MTBF)

The actual measured MTBF shall exceed 5 years, as verified by an Accelerated Life Test performed at Ericsson at a temperature of +75 deg C. To enable this testing to be conducted, the radio shall not suffer catastrophic failure (such as solder joints or plastic parts melting, etc) when operating at a 10/10/80 duty cycle, at temperatures of up to +80 deg C. Furthermore and in addition, Ericsson highly recommends that Kukjae shall perform calculations based on the bill of materials, verifying a theoretical 5 year MTBF, prior to submitting TMS samples to Ericsson.

4.4. Thermal Design Requirements

4.4.1. Maximum Temperature at Base of Components

With the radio operating at the maximum rated operating temperature and maximum rated duty cycle, in isothermal conditions and with no air flow over the radio, the actual measured temperature at the base of all components shall not exceed +80 deg C, or 5 degrees less than the maximum rated operating temperature of the individual component, whichever is lower.

4.4.2. Heat Transfer

To ensure adequate heat transfer out of the radio, the design shall include a thermal bridge between the power amplifier and the external metal back of the radio.

4.5. Component De-rating - Electrical

Under worst case conditions, no component shall be stressed beyond 70% of its rated voltage or current. The supplier shall calculate and provide to Ericsson, written verification of component de-rating at room ambient, and at worst case voltage and temperature extremes.

5. Product Service Requirements

5.1. Manuals

Maintenance, Operator, and Installation manual preparation and printing are the responsibility of Ericsson Technical Publications. The supplier shall supply technical information to Ericsson for manual development in both print and electronic form, at the same time the TMS sample radios are presented for Ericsson approval. The electronic version shall be in a mutually agreed upon, IBM compatible format. All technical information provided by the supplier, including schematics, shall be written in English.

This information includes but is not necessarily limited to:

- General Information
- Electrical Specifications
- IC Data for Custom or Modified (special) IC's
- Description/Theory Of Operation
- Block Diagram
- Parts Lists
- Electrical Schematics (with typical voltage readings)
- Mechanical Schematics
- Test Equipment
- Performance Tests
- Alignment Instructions
- Troubleshooting Hints

The mechanical schematics should include exploded views of the radio assembly and drawings of printed board assemblies, including printed board traces for each layer of circuitry and component layouts. Mechanical assembly/disassembly drawings **with torque specs** must also be provided by the supplier. All information submitted for the manuals should be reviewed and revised as product changes are made. Revised information, along with a revision list describing the changes, should be submitted to Ericsson for incorporation. Manuals will be printed and distributed by Ericsson. The operator's manual shall be 4 ¼ by 5 ½ inches in size.

5.2. Serviceability

The supplier has the responsibility to specify and design unique accessories required so field service technicians can test and repair the radio. Field repairs shall be on a board replacement level, and a component replacement level for any components with a value over $5.00. Replacement boards and components with values over $5.00 shall be available for service parts.

A Serviceability Review shall be held jointly by Ericsson and the supplier to determine the level of serviceability for the radio and the type and nature of parts and components to be stocked in Service Parts. All stocked items shall carry Ericsson part numbers.

5.3. Technical Support

The Ericsson Technical Assistance Center (TAC) shall provide daily customer support to resolve technical problems and questions with this product. If new or unusual technical problems arise, the supplier will be contacted by Ericsson engineering personnel for technical support.

6. Marking

6.1. FCC / DOC Nameplate Marking

The supplier shall mark the FCC/DOC nameplate with the applicable FCC and DOC identifications from the "product list" table appearing later in this document, and in accordance with the product views and dimensions contained herein.

6.2. Product Marking

Product marking must comply with Ericsson Corporate standards 102 01-101 Uen. Location of Article code, serial number, and date code marking shall be and in accordance with the product views and dimensions contained herein. Country of origin must be marked on this nameplate. The supplier must submit sample identification artwork for Ericsson approval.

6.3. Serial Numbers

Ericsson Inc. will issue serial numbers to the supplier for use on each radio. No references to the supplier name, logo, or registered marquees are allowed on any external surface of the radio.

6.4. Shipping Containers

Marking on individual and bulk shipping containers to comply with Ericsson standard 151 91-105 Uen. Bulk containers to be marked with quantity of units contained, Ericsson product code for units, purchase order for the units, and serial numbers of the units in the box in bar code and alpha numeric format.

7. Packing

7.1. Individual (Inner) Carton

7.1.1. Size

Cardboard carton of mutually agreed upon size.

7.1.2. Marking

Per “Marking” section contained herein, and as follows. One end of carton to be marked with a label containing the following information:

Ericsson Inc.
Model Designator
Frequency Split
Article code including R-state
Serial number in numeric and bar code form.

The supplier must submit sample identification artwork for Ericsson approval.

7.1.3. Package Durability

The individual carton must protect the product so that no damage will occur to the radio if it is dropped three times from a distance of 183 cm onto a concrete floor.

7.1.4. Contents

Each individual carton to contain one radio with UDC cover pre-installed, wrapped in a plastic bag.

7.2. Outer Carton

The outer carton will be of a size and weight as mutually agreed. (Note: Ericsson standard carton sizes are currently 21"x14"x11 7/8", or 23"x15 1/2" x 15 1/2", subject to change without notice). Outer carton marking to comply with Ericsson standard 151 91-105 Uen.

7.3. Skids

Incoming materials shall be packed on 42” x 48” skids, with height not to exceed 48”.

8. Accessory Compatibility

The product shall be designed and manufactured for full electrical and mechanical compatibility with the accessories listed below.

Accessory	Requirements	Kukjae Responsibility	Ericsson Responsibility
Battery, 1300 mAh NiCd	See specification BKB 191 212 /1	Provide mechanical interface details	Design & build (outsourced-Centurion)
Battery, 1600 mAh NiCd	See specification BKB 191 212 /2	Provide mechanical interface details	Design & build (outsourced-Centurion)
Battery, 1300 mAh NiCd Intrinsically safe	See specification BKB 191 212 /3	Provide mechanical interface details	Design & build (outsourced-Centurion)

Accessory	Requirements	Kukjae Responsibility	Ericsson Responsibility
Battery, 1600 mAh NiCd Intrinsically safe	See specification BKB 191 212 /4	Provide mechanical interface details	Design & build (outsourced-Centurion)
Battery Eliminator	See specification BKB 191 212 /5	Provide mechanical and electrical interface details	Design & build (outsourced-Centurion)
Desktop Charger	2 hour charge time	None	Design & build (outsourced-Tamura)
Antenna	¼ wave	Provide mechanical interface details	Design & build (outsourced-Centurion)
PC Radio Programmer	Compatible, including TQ-3370 interface box and custom programming cable	Provide memory map and other technical information as needed	Modify PC Programmer, Design & build all parts including custom programming cable
Test box and audio test cable	Compatible with TQ-6013 test box and audio test cable	Provide mechanical and electrical interface details	Design & build (outsourced)
Security Kit Accessories	Compatible	Provide mechanical and electrical interface details	Design & build (outsourced-Otto)
Carrying accessories such as leather and canvas cases with D-ring attachments and belt loops.	Compatible	Provide mechanical interface details	Design & build (outsourced)
Low Cost Speaker Microphone	PTT only	Provide mechanical and electrical interface details	Design & build (outsourced-Otto)
High end Speaker Microphone	PTT, emergency, volume control, & earpiece connector	Provide mechanical and electrical interface details	Design & build (outsourced-Otto)
Earpiece connector	Compatible with high-end speaker microphone	None	Design & build (outsourced)
Belt clip attachment & D-ring attachment with belt loop	Compatible with existing D-ring and belt clip attachment	None	Design & build (on battery) (outsourced)
Programming cable	Compatible	Provide mechanical and electrical interface details	Design & build (outsourced-Otto)
Audio test cable	Compatible	Provide mechanical and electrical interface details	Design & build (outsourced-Otto)

9. Design Requirements

9.1. Obsolete Components

All components shall be readily available for purchase in North America, from at least 2 commercial suppliers, with the following exception. Single sourced components may be used, if Kukjae first verifies that the components are not slated for obsolescence within the next 3 years. Any exceptions must be approved by Ericsson in writing.

10. Design Concept (Mechanical / Industrial)

10.1. Ericsson Approval Required

All aspects of the industrial design must be approved in writing by Ericsson Engineering, including items such as color and texture of finish; shape, size, and location of buttons, knobs, and switches; speaker size, appearance, and location; etc. Supplier should submit drawings and sketches to Ericsson for approval as soon as they are ready in draft format, and again prior to release. HMS and TMS radios should be representative of the final approved industrial design.

10.2. Materials

Any deviation from these materials requires advance written approval from Ericsson Engineering. This section is not intended to limit the suppliers ability to choose the best and latest available materials, however Ericsson will need to review and approve any material other than those listed below. Ericsson approval of a specific material does not relieve the manufacturer from responsibility for passing all applicable environmental requirements!

Application	Approved Material(s)	Notes
Case	GE Cycoloy C1200HF	Ok
Cast frame	Aluminum alloy	Ok
Shields	Nickel silver plate per C7521T	Ok
UDC cover	Polyurethane S198A	Ok
Battery contacts	0.3um gold, over 2.0um nickel, over brass	Thickness and grade must be sufficient to pass salt fog test
LCD window	MR-200 Acrylic + Hard Coating	Ok
Knobs	Plastic with thick, robust rubber overcoat	Kukjae material (HF-380 ABS) is NOT approved due to appearance, and lack of resistance to UV and body oils
Rubber Materials	Silicone per KE-951-U at durometer 50 +/- 10.	Emergency button, PTT button, UDC gasket, frame gasket, keypad.

10.3. Case colors/ textures

Case colors and textures shall be as specified by EUS in writing. Emergency button to be Pantone Red # 1788c 2X.

10.4. Protective finishes and Design for Salt Fog Test

All external metal parts to be protected against corrosion. Units must be designed to pass MIL-STD 810E salt fog test (48 hour exposure @ 5% NaCl) with no permanent corrosive damage.

10.5. Marking Durability

Shall pass the following durability test – 7000 cycles taber abrasion machine with CS-10 wheel @ 50 g load.

10.6. FCC labels

Vinyl or equivalent with overlay to prevent abrasive damage to printing. FCC label position to be between the radio and battery.

10.7. Appearance

All metal and plastic parts must be free of sharp edges, burrs, sink marks & unsightly flow line, gas marks and knit lines. Surface finish must pass standard SPI # AQ103 titled Cosmetic Specifications of Injection Molded Parts. Appearance surfaces defined as the cabinet top, front, and sides to meet Grade 1, Class A. Cabinet rear and bottom to meet Grade 2, Class B. Surface of radio rear covered by battery to meet Grade 3, Class C. A mutually approved sample shall be kept as the standard for inspection of all items (mechanical, appearance, workmanship, etc.) not specified on this drawing.

10.8. Battery fit

The battery must fit securely to the radio without rattles & discontinuities at the mating surfaces. The battery must remain attached to the radio when subjected to the MIL-STD-810 drop test. The battery release mechanism must operate smoothly & remain operable after tested to the MIL-STD-810 dust test.

10.9. Radio footprint

The radio shall have a flat or concave bottom surface so it will stand in a stable vertical position with the battery attached.

10.10. Scratch resistance

The LCD display window shall be constructed from a highly durable material or shall be coated with a scratch resistant coating to prevent its becoming scratched and damaged with normal customer abuse.

10.11. Controls

10.11.1. Volume control

The volume control knob will be the power on/off switch.

Rotary audio taper potentiometer directly controls audio level. Audio control signal is not sent to microprocessor, nor does it appear on the LCD display.

10.11.2. Control push buttons

DTMF model: 14 push buttons (PTT, emergency/home, up, down, monitor/clear, and a 12 button keypad (0, 1, 2, 3, 4, 5, 6, 7, 8, 9, *, #). The following features are also mapped to the keypad: 2=spc, 3=scn/add/del, *=sto, 0=lock, #=rcl)

SCAN model: 7 push buttons (PTT, emergency/home, up, down, monitor/clear, spc, and scan/add/del)

10.12. Connections

Terminations	Symbol	Function
1	ANT	50 ohm antenna connector
2	UDC	Universal Device Connector for external accessories (speaker, microphone, etc.)
3	BAT	Battery power connector (4 contacts)

10.13. Product Views And Dimensions

10.13.1. Notes

- Supplier to install nameplate in rear cover recess as shown.
- Nameplate to be marked with FCC ID and Canadian DOC acceptance numbers
- Serial number marked on nameplate is unique for each unit and from number block provided by Ericsson.
- Radio product code and revision marking to correspond to the Ericsson purchase order.
- Radios to be supplied with a UDC cover to ensure environmental endurance. (Not shown for clarity).
- Weight: 6 oz max (without battery)

(TBD – product view to be added at a later revision)

11. Product List

PRODUCT CODE	FREQUENCY BAND	MODEL TYPE	FCC MARKING	DOC MARKING
KRD 103 162 /081	800	System, Numeric	TBD	TBD
KRD 103 162 /082	800	Scan, Numeric	TBD	TBD
KRD 103 162 /181	800	System, Alphanumeric	TBD	TBD
KRD 103 162 /182	800	Scan, Alphanumeric	TBD	TBD
KRD 103 162 /091	900	System, Numeric	TBD	TBD
KRD 103 162 /092	900	Scan, Numeric	TBD	TBD
KRD 103 162 /191	900	System, Alphanumeric	TBD	TBD
KRD 103 162 /192	900	Scan, Alphanumeric	TBD	TBD

12. Revision History

Revision	Date	Revised By	Reason for Change
A	9/7/1999	J. Ferr	Initial release of specification. Includes updates to section 3.2 to eliminate G-MARC as a requirement, and to list G-STAR as TBD. Update to section 8 to reflect latest plans for battery and other accessories. Updated section 10.2 to reflect latest material approval status.
PA3	8/11/1999	J. Ferr	Changes to sections 3.2, 5.1, 8, 10.2, and 11. Also changes to Table 3.2.
PA2	7/12/1999	J. Ferr	Substantial changes to incorporate supplier and marketing inputs
PA1	6/12/1999	J. Ferr	First Draft

A5: PRODUCT SPECIFICATION (UDC)

Uppgjord (även faktaansvarig om annan) - Prepared (also subject responsible if other)		Nr - *No.*	
EUS/LT/A S. Miller	(804) 592-3921	1/1524-KRD 103 162 Uen	
Dokansv/Godk - *Doc respons/Approved* / Kontr - *Checked*		Datum - *Date* / Rev	File
EUS/LT/A (Jerry Ferr)		1999-12-17 / B	

UDC SPECIFICATION
LOW TIER EDACS PORTABLE RADIOS

1.0 Scope

This is a specification for a Low tier EDACS radio family UDC interface describing its performance and providing the necessary information for vendors to create accessories for the product.

1.1. Reference Drawings and Specifications

This document is one of a series of documents describing requirements for this transceiver, and is not a stand-alone specification. Additional requirements for this radio appear in many different documents. A complete list of all documents describing requirements for this transceiver, as well as a complete list of reference documents, is included in the following document:

ERICSSON PRODUCT SPECIFICATION (DOCUMENT NUMBER: 1301-KRD 103 162 Uen

2. UDC features

Interfaces to the following:

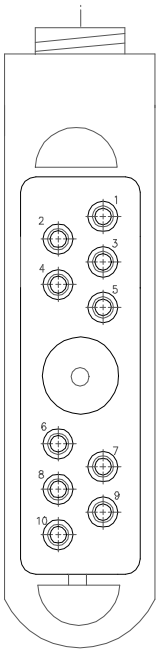
- Cable for interfacing with PC Programmer
- External speaker outputs (floating, short circuit protected)
- External microphone input
- Audio Test cable

3. Configuration

The UDC provides 10 electrical connections through chamfered holes approximately 1.5mm deep. The UDC has gold plated contact pads. An alignment lug in the radio housing provides anti-rotation protection using a mating socket on the accessory connector. The UDC is weather sealed so no water can enter the radio through the UDC, and the mating accessory connector has been designed to prevent water from reaching the contacts during normal use. The radio is supplied with a UDC cover which also provides protection against water and dirt in normal use.

3.1. UDC Pin Configuration

PIN NUMBER	FUNCTION
1	12V Programming Input
2	UDC Microphone Sense
3	External Speaker -
4	External Speaker +
5	Ground
6	Emergency
7	External Microphone
8	UDC Sense
9	RD data for programming
10	External PTT / TX data for programming



3.2. UDC pin electrical description

PIN NUMBER	PIN	FUNCTION
1	12V Programming Voltage	12V input allows the EEPROM to be programmed
2	UDC Microphone Sense	Pulling to Ground enables the external microphone
3	External Speaker -	16 Ohm External Speaker 0.5W
4	External Speaker +	16 Ohm External Speaker 0.5W
5	Ground	Ground
6	Emergency	Pulling to Ground enables the external Emergency
7	External Microphone	2.2k ohms to 2.9 VDC bias
8	UDC Sense	Pulling to Ground enables the external speaker
9	RD data for programming	TTL level buffered data line in
10	External PTT / TX data for programming	Pulling to Ground enables the external PTT / TTL level data line out

3.3. Electrical specifications

External speaker impedance	Drives 16 ohm speaker – floating output, short circuit protected against ground
Speaker rated output power	0.5 Watt
PTT impedance	1000 ohm to GND
Microphone impedance	2.2k ohms to 2.9 VDC bias
RF Noise Decoupling Capacitors	All cable lines should have a shunt capacitor of 220pF to GND.

3.4. Mechanical specifications

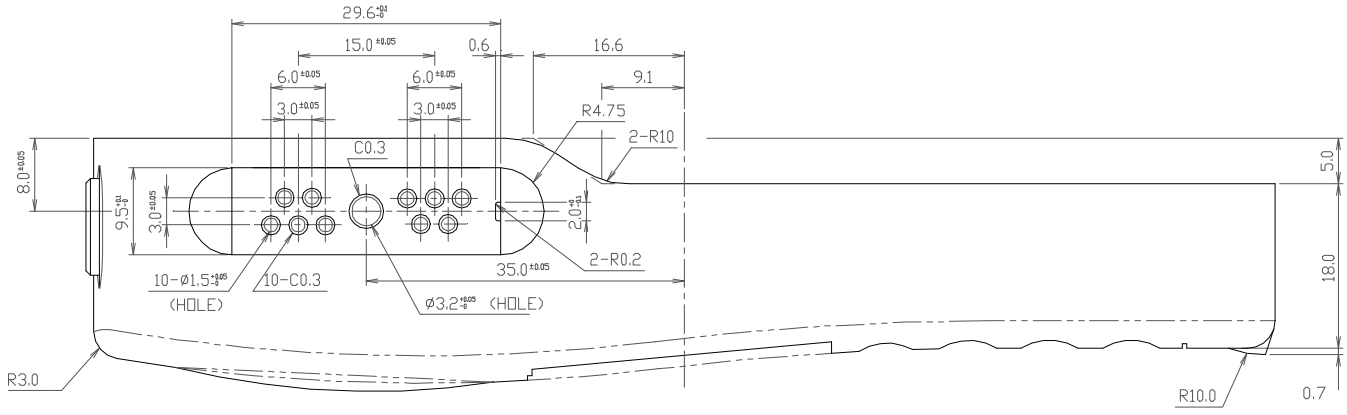
3.4.1. UDC mounting nut

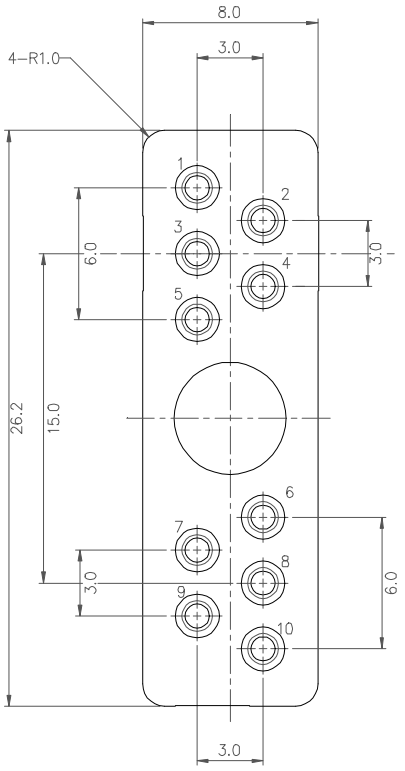
Stainless steel, 3.0 mm by 6.0 mm deep.

3.4.2. UDC contact plating

Base material – Copper clad flexible PC board
Base plating – Nickel 3-5 um
Surface plating – Gold 0.25 um

3.4.3. Low Tier EDACS radio case detail





4. Connection chart for external devices

4.1. Cable from radio to PC Programmer

CONNECT FROM	CONNECT TO
UDC Pin 1 12V Programming	VPP output of the TQ3370 programming box.
UDC Pin 2 (UDC MIC Sense)	Unused
UDC Pin 3 (External Speaker -)	Unused
UDC Pin 4 (External Speaker +)	Unused
UDC Pin 5 GND	GND
UDC Pin 6 (Emergency)	Unused
UDC Pin 7 (External Mic)	Unused
UDC Pin 8 (UDC Sense)	Unused
UDC Pin 9 RxD	TX output of the TQ3370 programming box
UDC Pin 10 TX (External PTT)	Rx input of the TQ3370 programming box
	A+ IN Pin 18 of the TQ3370 must be connected to A+ Out Pin 20 of the TQ3370 to allow proper programming.

4.2. Connections for Speaker/Microphone

PIN NUMBER	ELECTRICAL CONNECTION
UDC Pin 1 (Open)	Unused leave open circuit
UDC Pin 2 UDC MIC Sense	GND on this line enables the External Microphone
UDC Pin 3 External Speaker -	External Speaker -
UDC Pin 4 External Speaker +	External Speaker +
UDC Pin 5 GND	GND
UDC Pin 6 Emergency	GND this line causes the radio to declare an Emergency
UDC Pin 7 External Mic	External Microphone input
UDC Pin 8 UDC Sense	GND on this line enables the External Speaker Outputs.
UDC Pin 9 (RxD)	Unused
UDC Pin 10 External PTT / (TxD)	GND on this line causes the Radio to Transmit

4.3. Connections for Microphone

PIN NUMBER	ELECTRICAL CONNECTION
UDC Pin 1 (Open)	Unused leave open circuit
UDC Pin 2 UDC MIC Sense	GND on this line enables the External Microphone
UDC Pin 3 (External Speaker -)	Unused
UDC Pin 4 (External Speaker +)	Unused
UDC Pin 5 GND	GND
UDC Pin 6 (Emergency)	Unused
UDC Pin 7 External Mic	External Microphone input
UDC Pin 8 (UDC Sense)	Unused
UDC Pin 9 (RxD)	Unused
UDC Pin 10 External PTT / (TxD)	GND on this line causes the Radio to Transmit

4.4. Connections for earphone

PIN NUMBER	ELECTRICAL CONNECTION
UDC Pin 1 (Open)	Unused leave open circuit
UDC Pin 2 (UDC MIC Sense)	Unused
UDC Pin 3 External Speaker -	External Speaker -
UDC Pin 4 External Speaker +	External Speaker +
UDC Pin 5 GND	GND
UDC Pin 6 (Emergency)	Unused/Open
UDC Pin 7 (External Mic)	Unused
UDC Pin 8 UDC Sense	GND on this line enables the External Speaker Outputs.
UDC Pin 9 (RxD)	Unused
UDC Pin 10 (External PTT / TxD)	Unused

Note: Because the earphone is driven from an amplifier with a floating output with a DC level of approximately 3.75 volts, a resistor of equal value should be placed in series with each earphone lead to prevent potential damage to the users hearing if the earphone cord should become frayed and become electrically shorted to ground. The available drive voltage is approximately 15 volts peak to peak at clipping. The earphone should not be AC coupled, nor should it be coupled from either speaker output to ground since this will cause a large DC transient when the radio unsquelches.

4.5. Connections for Audio Testing Cable

PIN NUMBER	ELECTRICAL CONNECTION
UDC Pin 1 (12V Programming)	Unused leave open circuit
UDC Pin 2 UDC MIC Sense	GND on this line enables the External Microphone
UDC Pin 3 External Speaker -	External Speaker -
UDC Pin 4 External Speaker +	External Speaker +
UDC Pin 5 GND	GND
UDC Pin 6 Emergency	GND on this line causes an Emergency to be declared
UDC Pin 7 External Mic	External Microphone input
UDC Pin 8 UDC Sense	GND on this line enables the External Speaker Outputs.
UDC Pin 9 (RxD)	Tx output of the TQ3370 programming box
UDC Pin 10 External PTT / (TxD)	GND on this line causes the Radio to Transmit / Rx input of the TQ3370 programming box

4.6. Connections to TQ3370 and TQ0613 Boxes

PIN NUMBER	TQ3370 – DB25	TQ0613 – DB25
UDC Pin 1 12V Programming	Pin 5 Vpp	
UDC Pin 2 UDC MIC Sense		Pin 17 GND
UDC Pin 3 External Speaker -		Pin 14 SPKR-
UDC Pin 4 External Speaker +		Pin 1 SPKR+
UDC Pin 5 GND	Pin 17 GND	Pin 17 GND
UDC Pin 6 Emergency		
UDC Pin 7 External Mic		Pin 12 Mic Out
UDC Pin 8 UDC Sense		Pin 17 GND
UDC Pin 9 RxD	Pin 12 TX	
UDC Pin 10 External PTT / TxD	Pin 11 RX	Pin 11 PTT
	Pin 18 A+ IN connected to Pin 20 A+ Out	

TQ3370 programming interface box will need to be powered by an external power supply to program the radio. The radio must be powered on before the TQ3370 is powered on. This will prevent inadvertent scrambling of the EEPROM.

5. Revision History

Revision	Date	Revised By	Reason for Change
B	17 Dec 99	STM	Added details about the programming cable. Added VPP requirement for UDC Pin 1 to program.
A	7 Sept 99	STM	Refined UDC cable head drawing. Added Emergency.
PA1	14 July 99	STM	Original document