CONTROL MODULE
AT04872/-

INTRODUCTION

The basic control module provides an interface for local on-site control together with all the transmitter and receiver audio clipping, filtering and switching circuits. Both carrier and noise squelch detection circuits are included and also the audio filters and 2970 detectors necessary for simple (TX/RX only) 2 or 4 wire M80 series remote control.

In this form the module comprises three PCB assemblies:

(i) audio board

(ii) logic board

(iii) front panel

DETAILED DESCRIPTION

CONTROL AUDIO BOARD

The functions of the control audio board are divided as follows:

(i) Rx Audio - AF processing, squelch switching, Rx call generator data combining network and line amplifiers.

(ii) Tx Audio - AF processing, notch filter and tone detector, audio switching and line amplifier.

(iii) EHS Interface - Audio switching and mute control; monitor amp.

Rx Audio

Unprocessed audio from the receiver module is fed, via the backplane to the control logic board and then to the audio board on PLD pin 36. The signal is fed to an active high-pass filter IC47(a+b) and is then de-emphasised in IC39(b) and passed to the delay equaliser IC39(a). LK26 sets the de-emphasis response (A-B flat; B-C de-emphasised) and IC39(a) provides 'good' group delay equalisation.

The output from IC39(a) is fed two ways:

(i) To the T/T audio gate IC43(d) at a level set by RV5.

(ii) To the squelch controlled audio gate IC46(a). The squelch gate is enabled by a SQUELCH OPEN 'high' from the logic board on PLD pin 27, audio passes to IC39(c+d) an active low-pass filter. When the squelch control line is 'low' the gate is disabled and DC inhibits the audio line. The output from the filter is fed to the EHS audio line PLD pin 33 and the monitor amp IC35(d) and to the audio routeing gates IC44(b+c). The action of these two gates is controlled by inputs from the logic board:

a. In the 'normal' mode of operation the MANUAL input, PLD pin 22, is 'high', this enables gate IC44(c) allowing audio to pass via the notch filter to the line drivers.

b. In the receiver mute condition the MUTE GATE input, PLD pin 21, is 'high', this enables gate IC44(b) and a DC level is applied to the audio line, thus inhibiting the AF path.

The notch filter IC34 is linked into circuit via LK27 and is used to remove any 2970Hz keytone frequency component present in the audio signal. The balanced line driver amplifiers IC38(a,b,c+d) provide an audio output to the 600Ω line at a level set by RV16. LK28 sets the output attention.

Rx Call

The Rx call generator IC29 produces a 2970Hz Rx call tone when commanded to do so by the logic switching input on PLD pin 35. The oscillator circuit XL1, IC27(d,e+f) produces a frequency of 29,7kHz which is applied to the CLK input of the generator. When the RX CALL line is 'high' the generator is enabled, IC29 divides the oscillator output by 10 and produces four outputs on Q1-Q4 which are summed across R184-R187 to produce a 2970Hz sine wave. RV15 sets the Rx call tone level and IC37(d) matches the generator output to the bandpass filter IC37(b) which 'cleans up' the sine wave output. Two other inputs are also applied to the matching stage - Tx audio from the 600Ω line, via LK24, when 4 wire intercom is used and data from the RCM at a level set by RV14.

The output from the filter IC37(b) is combined with the Rx audio and fed to the line drivers at a level set by RV16, then passed to the RX 600Ω line.

Tx Audio

The transmitter audio input to the control module may be carried on either a 2-wire or 4-wire line. On 4-wire schemes the audio inputs are on two separate pairs of wires, but for 2-wire applications both the Tx audio and Rx audio inputs are applied across the 'Rx 600Ω O/P' (PLB pins 4 and 22) and fed to the Tx 600Ω amplifier via the hybrid circuit IC37(c).

Tx audio routed via LK21 and LK20 is amplified by IC31(b) then fed, via the sensitivity control RV9, to the high-pass filter IC31(c). A two-stage notch filter IC33(a+b) removes the 2970Hz keytone component and IC35(c) provides group delay equalisation. Audio from the high-pass filter IC31(c) and the output from the 2nd stage notch filter is also routed to LK24, for use in 4-wire intercom applications. The 2970Hz tone extracted by the 1st stage of notch filtering is detected in IC36(c), passed through band-stop notch filter IC36(a+d) and fed via buffer IC36(b) to the 2970 DET line PLD pin 31.

Audio from IC35(c) is routed to the line audio gate IC43(b) which is enabled when the LINE input on PLD pin 13 is 'high'. IC35(b) is a variable gain amplifier controlled by compressor TR14 using the output from limiter IC41(a). Pre-emphasis is provided by IC35(a) whose response is set using LK15. TR8-TR9 prevent the limiter reaching the positive and negative rails and in addition the signal on TR8 collector is 'fed back' to operate the compressor TR14. Thus, the compressor only controls the variable gain amplifier once limiting is reached and is switched off 'out-of-limiting'.

During RCM operation TR15 is made to conduct by the DATA ENABLE input on PLD pin 17 going 'high' effectively grounding the feedBack path to the compressor.

The Tx audio path is inhibited when data from the RCM is present.

Audio from the limiting circuit is amplified by 1C41(b) with RV3 setting the peak deviation. IC32(a) combines the Tx audio signal with the CTCSS tone (via LK14) which may be either generated externally or on the logic board. The combined signal is applied to the low-pass filter which removes unwanted harmonics then fed, via LK19 to the high-pass filter IC32(c). LK19 is set according to the required channel spacing to select the appropriate value of resistor that will give the correct frequency response. LK19 linked 1A-1B gives high frequency roll-off for 12,5kHz spacing. The output on PLB pin 28 is applied, via the backplane, to the Tx driver module.

EHS Interface

Provision has been made for an engineer's handset (EHS) to be connected to the control module front panel. The control audio board houses the interface between the EHS and the Tx audio and Rx audio circuits.

Microphone audio across PLD pins 2 and 1 is amplified in IC31(d) with RV10 setting the sensitivity, then routed to the mic. audio gate IC44(a). A MIC ENABLE 'high' on PLD pin 12 enables the gate and mic. audio passes to the variable gain amplifier and pre-emphasis circuits.

Receiver audio from the output of the low-pass filter, IC39(d), is routed to the monitor amplifier IC35(d) and to the EHS earpiece, via PLD pin 33. The output from the monitor amplifier is applied, via the backplane to the monitor loudspeaker located on the PSU module. Audio to the EHS earpiece is routed via the control front panel.

In the transmit mode the Rx audio route to the EHS is inhibited through TR18 unless 'linecom' is selected on the front panel then the audio is routed through TR10 to the EHS.

CONTROL FRONT PANEL

The front panel of the control module houses the EHS socket, control switch and function indicators.

Engineers Handset

The engineers handset (EHS) is connected to the 7-pin DIN socket [O] SKE on the front panel and is used in conjunction with the function switch SA to provide various engineering facilities.

Connection of the handset is sensed by diodes D1 and D2. The MAKE or BREAK line is connected to COM (-ve) according to operation of the pressel.

Switch SA selects either the NORMAL mode or one of five facilities in the MANUAL mode.

NORMAL (SA position 1)

The EHS is non-functional irrespective of the operation of the pressel. The +14V line is connected via SA2 to the NOR gate IC1(a) and to IC1(b) pin 6. LED6 is held off via TR6 and the 'high' on the output of IC1(d) switches on TR5 to light LED7 (NORMAL). The MANUAL line PLA pin 20 is 'high' which provides a 'high' to the MANUAL and MIC ENABLE lines on the audio board, via the logic board.

MANUAL (SA positions 2-6)

Either the MAKE or BREAK line on PLC is connected to -ve as determined by the operation of the pressel. This -ve ('low') is detected by either D1 or D2 and applied to the NOR gate IC1(a) which produces a 'high' output fed via SA1 to the function control lines. IC1(d) provides an output 'low' which holds off LED7 (NORMAL) and inhibits the receiver path on the audio board. The detected 'low' also enables gate IC1(b) allowing the output from oscillator IC2(a) to switch TR6, thus causing LED6 (MANUAL) to flash.

MON. AUDIO on PLA pin 19 is applied to the buffer amplifier IC2(b) then fed to the EHS earpiece.

(i) LINECOM (SA position 2)
The 'high' on the LINECOM control line PLA pin 30 is routed via the logic board to produce a 'low' at the audio board PLD pin 20 which holds off TR10 thus preventing receive audio reaching the EHS earpiece.

(ii) BROADCAST (SA position 3)
The BROADCAST control line PLA pin 26 is connected directly to the +14V line. All audio paths are enabled as for 'normal' operation; use of the EHS enables communication 'over-the-air'.

(iii) SQ DEFEAT (SA position 4)
The 'high' on the SQ DEFEAT control line PLA pin 28 produces a 'high' from the logic board on PLA pin 23 which lights LED2 (SQUELCH), via TR1, and provides a 'high' to the audio board on PLD pin 27 to enable the squelch audio gate IC46(a).

This facility is used for receiver alignment; use of the EHS enables communication 'over-the-air'.

(iv) T/T (SA position 5)
The 'high' on the T/T control line PLA pin 29 produces a 'high' from the logic board on PLA pin 25 which lights LED4 (T/T), via TR3, and provides a 'high' to the audio board on PLD pin 18 to enable the T/T gate IC43(d). This facility is used for setting the talkthrough level; use of the EHS enables communication 'over-the-air'.

(v) TX ON (SA position 6)
The 'high' on the TX ON control line PLA pin 24 is applied to the logic board which produces the following outputs:

a. A 'high' on PLA pin 21 which lights LED3 (TX ON), via TR2.

b. A 'high' to the audio board on PLD pin 13 to enable the line gate IC43(b).

c. A 'low' to the audio board on PLD pin 29 to inhibit the mic enable gate IC44(a) thus preventing EHS mic audio reaching the transmitter.

This facility provides a continuous unmodulated carrier for transmitter alignment, operation of the pressel will provide modulation from the 600Ω line input enabling adjustment of the line sensitivity and CTCSS level.

Alarm Indication

In the alarm condition a 'low' is present on PLA pin 13 which enables gate IC1(c). TR4 is switched at a rate determined by oscillator circuit IC2(a) causing LED5 (ALARM) to flash.

CONTROL LOGIC BOARD

This board provides all the logic switching for the control module which determines the audio routeing, tone routeing, alarm switching and facility controls. Circuits are provided for carrier level and noise squelch control and a linkable interface enables connection of a remote control module.

Squelch Control

Noise Squelch - Rx noise from the receiver module on PLB pin 2 is applied to amplifier IC42(a) at a level set by RV2 (NOISE SQUELCH). The output is detected by IC40(a), D2(a), D2(b) and fed to low pass filter IC42(b) (which has a low roll-off characteristic) producing a DC level which is applied to schmitt trigger IC30(a). The schmitt trigger output is fed to NAND gate IC20(b) and is used to light LED8 (NOISE SQUELCH) via TR21.

Carrier Level Squelch - The carrier level input on PLB pin 20 is combined with the offset voltage from RV1 in DC amplifier IC30(b). Low pass filter IC30(c) and schmitt trigger IC30(d) operate in a similar manner to the noise squelch circuit to produce an output which is fed via LK6 to NAND gate IC20(b). LED10 indicates CARRIER SQUELCH. LK6 (NOISE SQ. ONLY) is normally linked A-B but may be left open circuit to allow operation from noise squelch only and enable the carrier squelch output to be linked via P24 to an open collector output for use as an external facility.

The third input to NAND gate IC20(b) is derived from the RX INHIBIT input (FAC8) and provided all three inputs are 'high' the resultant output from NAND gate IC16(a) is also 'high'. LK5 (SQUELCH RESPONSE) and D3, R65, C12 provide a time constant circuit which prevents 'chatter'.

The AND gate IC9(d) combines the carrier present 'high' from IC16(a) with a tone valid input from IC6(a) to produce a tone + carrier output which is routed through LK10 and available as an open collector output on TR4.

LK10 routes the 'tone + carrier' signal according to the squelch control function required.

(i)	Position 1 (SQ)	direct feed to AND gate (IC9(c)
(ii)	Position 2 (TT)	direct feed to RCM interface IC3 and via inverter IC25(d) to talkthrough enable gate IC8(d)
(iii)	Position 3	spare
(iv)	Position 4 (EXT, FAC)	external facility via RCM interface IC3

A 'high' on IC9(c) pin 8 enables the AND gate IC9(c) allowing the carrier present signal from IC16(a) to be fed to the squelch control gate. The carrier present input is also fed to the RCM interface and is available as an open collector output on TR3.

The squelch control gate IC21(a) also accepts three other inputs derived from the squelch defeat line, via IC12(a), and from the manual squelch defeat control on the front panel. When any of the inputs are 'high' the OR gate produces a logic 1, which is fed via IC11(a), to the SQUELCH OPEN line. The output from IC11(a) is controlled from IC15(d) whose inputs are derived from the RX INHIBIT line and the ON LINE DATA ENABLE line. A 'high' from IC15(d) enables gate IC11(a) producing a SQUELCH OPEN 'high' causing the squelch gate on the control audio board to open and the front panel squelch indicator to light

Rx Call

The Rx Call type is set by LK11 which may be linked to allow SQ DEFEAT to control RX CALL for compatibility with the 4000 series of equipments, or (as standard) RX CALL not controlled by SQ DEFEAT.

The AND gate IC10(d) is controlled by the output from IC15(d) (derived from the RX INHIBIT line) producing an Rx Call input to the audio board, via OR gate IC6(b). This signal also provides an Rx Call indication on the front panel, is fed to the RCM interface and is provided as an open collector output from TR5.

Manual Control

When the equipment is in the manual mode of operation a 'low' is applied to the MANUAL input on SKA pin 20 which is routed as follows.

Directly to:

(i) IC19(a) for MIC GATE control on PLD pin 12

(ii) the audio board on PLD pin 22 to disable IC44(c)*

and via R241 to:

(i) IC49(b) for MUTE GATE control on PLD pin 21

(ii) piptone gate IC22(b)

(iii) the DISABLE ASSORT gate IC5(a), the LINE DATA ENABLE gate IC5(b) and MAN ALARM generator TR2, via inverter IC26(c)

(iv) RCM interface, IC4

**Note: Resistor R309 on the audio board may be removed if the Rx audio line is required to be inhibited in the manual mode.*

Tx Key

The Tx Key input from the control equipment is applied on PLB pin 11. It is fed to the RCM interface link LK1 and combined with the 2970Hz detector input (from the audio board) in IC8(c). The output from this AND gate is passed to the audio board on PLD pin 30 (TX) and fed, via the inhibit gate IC14(c), to the Tx control gate IC21(b). The presence of a TX INHIBIT input, fed through IC14(a) and IC26(b), will pull this input low, via D11(b), and is also applied to the talkthrough gate IC19(b), via D11(a).

In addition to the Tx Key line the OR gate IC21(b) inputs are derived from the ALARM AIR DATA ENABLE line, via IC13(a), the manual TX ON input from the front panel and EHS control gate IC19(a). When any of these inputs are 'high' a logic output results, this is used to inhibit the receiver, via IC8(a), when LK8 is set for simplex operation and to provide a Tx Key input to the transmitter driver, power amplifier module and RCM. If LINECOM is selected the Tx Key line is inhibited in IC22(a).

Talkthrough (T/T)

Talkthrough may be initiated either by a backplane (active low) input on PLB pin 23 or by a tone input on SKA pin 3. The backplane input is fed directly to IC8(d) and tapped off to the RCM interface link LK1. The tone input is combined with the carrier in IC9(d) and routed, via LK10:2A-2B and inverter IC25(d), to IC8(d). If either input on IC8(d) is 'low' the output is also 'low' and providing the gate IC14(d) is enabled (i.e.: manual mode not selected) the output from IC8(d) is inverted and fed as a 'high' to IC6(c). If the manual mode is selected the talkthrough input is inhibited by IC14(d) and the input to IC6(c) is derived from the front panel switch (MAN T/T) input. For either condition a 'high' is fed to IC11(b). This AND gate is controlled by the output from IC23(a) such that if any input on pins 2-5 is 'high' a 'low' is produced which inhibits the talkthrough line. The output from IC11(b) provides the front panel T/T ON indication and is fed to AND gate IC10(c) which is in turn controlled by the carrier present output from IC9(d). IC19(b) produces a 'low' for the T/T hangtime circuit which 'holds' talkthrough during any fluctuations in audio level. A 'high' from IC16(c) is routed via IC6(d) and IC22(a) to providing Tx Key to the driver and power amplifier modules as previously described.

Alarms

The alarm inputs are applied via the backplane, the supply alarms are active 'high' all others being active 'low'. The TX, RX, VSWR and PA Temp alarm inputs have a direct feed to an alarm indicator. LK30 provides a means of overriding the supply alarm input to prevent an alarm condition each time a module is disconnected. All alarm inputs are 'paralleled' to the RCM interface.

Rx Alarm - The RX ALARM and RX SUPPLY ALARM (inverted in IC26(f)) are combined in IC24(c). Provision is made for an additional input on P20. The combined alarm output is routed via LK7 to AND gate IC24(b) and following inversion by IC26(a) may be used to disable the receiver, via LK9. With LK7 open circuit P19 may be linked to an open collector output to provide a separate external Rx alarm indication.

Power Alarm - NOR gate IC15(a) and AND gate IC8(b) each compare the forward power input from the TX PA with the Tx Key sense line. If only one input is present each gate produces an output 'high' which results in a 'low' from inverter IC25(b) causing LED6 (PA O/P ALARM) to light.

Tx Alarm - IC28(a) combines and inverts the PA SUPPLY ALARM, TX SUPPLY ALARM and an input from the power alarm circuit to produce a 'low' which is combined, in IC24(a), with the TX ALARM and VSWR ALARM (via D13) providing an output 'low' which is inverted by IC26(d) and applied to the latching circuit IC28(b+c).

The latching circuit provides for simple mains/standby configurations using an input on P17, with the output taken off P18 and indicated by LED2 (LATCH).

The output from the latching circuit is combined, in IC24(b), with the Rx alarm from IC24(c) and an external alarm input (indicated by LED7). The output from IC24(c) is in turn combined with the VSWR ALARM and PA TEMP ALARM in IC20(a) to provide a single alarm indication to the front panel, via IC16(d). The output from IC24(b) is also available from the open collector of TR6.

RCM Interface

The RCM interface circuit provides for the connection of a basic (TX/RX only) M80 type control unit. LK1 provides linkable facilities with IC1-4 performing a serial-to-parallel data conversion.

IC7 (a+b) enables the carrier squelch to be adjusted (using RV1) or defeated from an RCM or (by linking P6/P5 and disconnecting D7) provide 3 set levels of squelch de-sensitisation.

Similarly, IC13 (c+d) provide control of the PA (from inputs on P7, P8) using gates IC45 (a, c + d). Three set levels of 3dB, 6dB and 10dB are available.

SPECIFICATION

General

Supply input	18V ±0,5V at 0,5A maximum (without RCM but including options PCB)
Connectors	Interface to Backplane 37 way D plug Interface to RCM 16 way BERG header Interface to Option PCB 18 way BERG header Engineers Handset 7 way DIN socket
Indicators	Front Panel: Squelch TX ON Talkthrough Alarm Normal Manual Internal: TX Alarm RX Alarm PA Temp Alarm PA O/P Alarm VSWR Alarm Latched TX Alarm External Alarm 2970 Detector Noise Squelch Carrier Squelch

TX Audio Path

Audio Response	Base Station (12,5kHz) Rel 6dB/oct 300 - 3000 Hz +0,5 -2,8 dB Base Station (20/25kHz) Rel 6dB/oct 300 - 3000 Hz +0,5 -1,5 dB
Line I/P impedance	600Ω balanced
Line I/P sensitivity	4-wire -37 to 0dBm (for 60% deviation at 1kHz) adjustable 2-wire (remote) -16 to 0dBm (for 60% deviation at 1kHz) adjustable
EHS Mic I/P	600Ω approx
EHS Mic sensitivity	2mV (for 60% deviation at 1kHz)
TX Audio O/P impedance	100Ω approx
TX Audio O/P level	300mV/60% (12,5kHz) 480mV/60% (20kHz) 600mV/60% (25kHz)
S/N Ratio	Greater than 50dB rel to 60% deviation level
Distortion	Less than 0,5% (measured at 1kHz/60%)

RX Audio Path

Audio Response	Base Station (12,5/20/25kHz) Rel 6dB/oct 300 - 3000 Hz +0,5 -1,0 dB
Line O/P impedance	600Ω balanced, via external transformer
Line O/P level	4-wire -37 to +4dBm (for 60% deviation at 1kHz) adjustable 2-wire (remote) -16 to 0dBm (for 60% deviation at 1kHz) adjustable Note on 2-wire system, O/P level should be within 6dB of TX input level
RX Audio I/P impedance	3kΩ approx
RX Audio I/P level	300mV (for 60% deviation)
S/N Ratio	Greater than 50dB rel to 60% deviation level
Distortion	Less than 0,5% (measured at 1kHz/60% at +4dBm 600Ω O/P level)
Noise Squelch range	8 to 18dB SINAD adjustable (Normally preset to 10dB SINAD)
Carrier Squelch range	0,3 to 10μV adjustable

EXTERNAL CONTROL INTERFACE

The following control functions, with the exception of the 600Ω interface, are available at the facilities connector (37 way D type):

*Note: (i) Facilities marked * are secondary functions which require linking on the control module to bring them to the facility connector.*

(ii) The 600Ω interface can be brought to the facility connector by changing a link on the backplane PCB. For direct connection to British Telecom lines the Krone block must be used.

Control Inputs (pull 'low' to enable function):

(TX Facilities) -	TX Key Talkthrough Disable TT Disable CTCSS Tone PA Power Reduction (3dB) * PA Power Reduction (6dB) *
(RX Facilities) -	Squelch Defeat Tone Defeat (CTCSS) Disable RX Disable ASSORT ASSORT Override Carrier Squelch Defeat * (i.e. Noise Squelch only) Carrier Squelch Desensitisation * (6dB)

(General Facilities) External Alarm input (to generate station alarm from ancillary Equipment)
EHS Enable * (enables EHS in NORMAL mode)
On Line Date Enable *
Channel Control (7 lines common RX/TX - Synthesised only)

Logic Outputs (Open Collector pulling to -ve):

(TX Facilities) - TX Alarm * (Normally combined with RX Alarm to give Station Alarm).
Ext C/O relay (For driving relay connected to +24V only)
Mod Monitor (Linkable alternative to analogue mod monitor)

(RX Facilities) - RX Call
Tone Controlled Facility
Carrier Controlled Facility *
RX Alarm *

(General Facilities) - DC Standby Alarm
Station Alarm (Combined RX/TX Alarm)
Manual Alarm (Indicates use of EHS manual control)
EHS Mic enabled *

Audio Inputs:

TX 600Ω input (balanced)
Ext CTCSS input * (unbalanced)

Audio Outputs:

RX 600Ω output (balanced)
RX unprocessed audio (unbalanced)
External loudspeaker

Analogue Outputs:

RX carrier level monitor
TX mod monitor
RF power monitor

INTERNAL MODULE INDICATIONS

Noise Squelch — Indicates that the noise squelch threshold has been exceeded.

Carrier Squelch — Indicates that the carrier squelch threshold has been exceeded.

2970 Detect — Indicates that a 2970Hz keytone has been detected.

PA Output Alarm — Indicates that the power control loop in the PA can no longer maintain the correct RF output power. Also indicates the presence of an RF output when the transmitter is not keyed.

Note: For the two stages of temperature shutdown in the PA, complete shutdown will generate a PA O/P alarm, whereas partial shutdown (3dB) will not.

TX Driver Alarm	Indicates an alarm generated by TX driver, caused by: cold oven RF fail high internal temperature out-of-lock (synthesised only)
PA Temperature Alarm	Indicates high temperature in the PA module resulting in either 3dB or total shutdown. (PA O/P ALARM will show which.
VSWR Alarm	Indicates that the VSWR at the PA output exceeds approximately 3:1 and proportional shutdown is operative.
TX Alarm Latch	When enabled, indicates that one of the following alarms is active: TX supply alarm TX driver alarm PA supply alarm PA O/P alarm VSWR alarm Can be reset by temporarily disabling. Used only in simple main/standby configurations.
RX Alarm	Indicates alarm (other than supply alarm) generated by RX module, caused by: injection fail out-of-lock (synthesised)
External Alarm input.	Indicates alarm signal present on external alarm
Manual Alarm	Indicates that MANUAL mode has been selected from the front panel and therefore the local control inputs have been disabled.

CONTROL MODULE

AT04872/01	Control System Code 12,13	Secondary Option 00
AT04872/05	Control System Code 12	Secondary Option 03,04
	Control System Code 13	Secondary Option 01-04
AT04872/06	Control System Code 21-24	Secondary Option 00
	Control System Code 31-34	Secondary Option 00
AT04872/07	Control System Code 21-24	Secondary Option 03,04
	Control System Code 31-34	Secondary Option 01-04
AT04872/08	Control System Code 11	Secondary Option 00
AT04872/09	Control System Code 11	Secondary Option 03,04

Cct. Ref	Description	Part No.	Remarks
	PCB assembly control logic	AT29023	
	PCB assembly control audio	AT29024/01	/01,05-07
	PCB assembly control audio	AT29024/05	/08,09
	PCB assembly front panel	AT28997/01	
	PCB assembly Voting/CTCSS	AT29061	/05,07,09
	M80 Signalling assembly	AT14920	/06,07
	Socket assembly 7-way DIN	AT14815	Engineers handset
	Knob printed	BJ30904/04	1/S1
	Spindle	BT07168	1/control knob-S1
	Circlip	QA01107	1/control knob
	Spire clip	QA04145	1/control knob
	Pillar hexagon	BT04463	4/audio screen-audio PCB
	Pillar 35mm long	BT04075	/05,07,09
	Pillar 7,1mm long	BT04074	/05,07,09
	Bushing shorty	FG02736	6/audio screen
	Scr st tap pozi No.6 x 6,4mm	QJ07703/B	4/plate assy mtg-bracket
	Scr st pan pozi M3 x 6mm	QJ11901/X	4/control PCB 4/logic PCB
	Scr st tap pozi No 4 x 8mm	QJ08241/X	/06,07
	Nut st M3	QA11605/X	4/audio screen-audio PCB

FRONT PANEL ASSEMBLY
AT14818

Panel, front, printed	BJ30975	
Fastener	BT17284	4/control module-shelf
Handle	BT35950	
Label Philips	BT38217/01	1/handle
Label RCM	BT38206/02	1/handle
Scr st tap pozi No.4 x 8mm	QJ08241/X	3/handle

PCB ASSEMBLY CONTROL LOGIC
AT29023

Semiconductors and IC's

IC1-4			Not Used
IC5-7	IC 4071B	FU99408/SM	
IC8-11	IC 4081B	FU99413/SM	
IC12-15	IC 4001B	FU99400/SM	
IC16	IC 4011B	3513 999 35002	
IC17	IC 4075B	FU99411/SM	
IC18,19	IC 4025B	FU99405/SM	
IC20	IC 4023B	FU99404/SM	
IC21	IC 4072B	FU99409/SM	
IC22	IC 4073B	FU99410/SM	
IC23	IC 4002B	FU99401/SM	
IC24	IC 4073B	FU99410/SM	
IC25	IC 4049B	FU99471/SM	
IC26	IC 4069UB	FU99472/SM	
IC27			Not Used
IC28	IC 4025B	FU99405/SM	
IC29			Not Used
IC30	IC Quad op amp LM348	3513 999 45003	
IC31-39			Not Used
IC40	IC Dual op amp 4558	FU99806/SM	
IC41			Not Used
IC42	IC Dual op amp 4558	FU99806/SM	
IC43,44			Not Used
IC45	IC 4066B	3513 999 35019	
IC46,47			Not Used
IC48	IC volt reg 317	FU99119	
IC49	IC 4001B	FU99400/SM	
TR1-6	Transistor BCX19	FV99102/SM	
TR7	Transistor BC337 GP	FV05896	
TR8-11			Not Used

Cct. Ref	Description	Part No.	Remarks
Semiconductors and IC's Cont'd			
TR12,13	Transistor BCX19	FV99102/SM	
TR14,15			Not Used
TR16	Transistor BCX19	FV99102/SM	
TR17,18			Not Used
TR19	Transistor BCX17	3513 999 00004	
TR20-22	Transistor BCX19	FV99102/SM	
D1	Diode GP 1N4148	FV05808	
D2,3	Diode BAV99 SMD	3513 999 15002	
D4-6			Not Used
D7	Diode GP 1N4148	FV05808	
D8	Diode BAV99 SMD	3513 999 15002	
D9,10			Not Used
D11	Diode BAV70 SMD	3513 999 15000	
D12			Not Used
D13	Diode GP 1N4148	FV05808	
D14			Not Used
D15	Diode BAV99	3513 999 15002	
Resistors			
R1	10k ±5% 0,125W SMD	3513 999 80048	
R2,3			Not Used
R4-10	10k ±5% 0,125W SMD	3513 999 80048	
R11	2k2 ±5% 0,125W SMD	3513 999 80040	
R12-27	10k ±5% 0,125W SMD	3513 999 80048	
R28			Not Used
R29	1k ±5% 0,25W c film	PM01436	
R30	150k ±5% 0,25W c film	PM01462	
R31	10k ±2% 0,25W m film	PM99306	
R32	100k ±5% 0,125W SMD	3513 999 80060	
R33	100 ±5% 0,125W SMD	3513 999 80024	
R34-36			Not Used
R37	10k ±5% 0,125W SMD	3513 999 80048	
R38	75k ±2% 0,25W m film	PM99327	
R39	150k ±2% 0,25W m film	PM99334	
R40			Not Used
R41	10k ±2% 0,25W m film	PM99306	
R42	15k ±2% 0,25W m film	PM99310	
R43,44	10k ±5% 0,125W SMD	3513 999 80048	
R45	10k ±2% 0,25W m film	PM99306	
R46	33k ±2% 0,25W m film	PM99318	
R47	33k ±2% 0,25W m film	PM99318	
R48	10k ±2% 0,25W m film	PM99306	
R49	16k ±2% 0,25W m film	PM99311	
R50	100k ±2% 0,25W m film	PM99330	
R51,52	10k ±5% 0,125W SMD	3513 999 80048	
R53	3k9 ±2% 0,25W m film	PM99296	
R54	39k ±2% 0,25W m film	PM99320	
R55	2k2 ±2% 0,25W m film	PM99290	
R56	82k ±2% 0,25W m film	PM99328	
R57	22k ±2% 0,25W m film	PM99314	
R58	47k ±2% 0,25W m film	PM99322	
R59-61	33k ±2% 0,25W m film	PM99318	
R62	27k ±2% 0,25W m film	PM99316	
R63	12k ±2% 0,25W m film	PM99308	
R64	2k2 ±5% 0,125W SMD	3513 999 80040	
R65	100k ±2% 0,25W m film	PM99330	
R66	1k ±5% 0,125W SMD	3513 999 80036	
R67,68			Not Used
R69	10k ±2% 0,25W m film	PM99306	
R70	10k ±5% 0,125W SMD	3513 999 80048	
R71			Not Used
R72	10k ±5% 0,125W SMD	3513 999 80048	
R73	18k ±2% 0,25W m film	PM99312	
R74	4k7 ±2% 0,25W m film	PM99298	
R75	8k2 ±2% 0,25W m film	PM99304	
R76-83	10k ±5% 0,125W SMD	3513 999 80048	
R84-86			Not Used
R87	6k8 ±5% 0,125W SMD	3513 999 80046	
R88-99			Not Used
R100	220 ±5% 0,125W SMD	3513 999 80028	
R101	1k8 ±5% 0,125W SMD	3513 999 80039	
R102-232			Not Used
R233,234	10k ±5% 0,125W SMD	3513 999 80048	
R235	100k ±5% 0,125W SMD	3513 999 80060	

Cct. Ref	Description				Part No.	Remarks
Resistors Cont'd						
R236	10k	±5%	0,125W	SMD	3513 999 80048	
R237-240						Not Used
R241-244	10k	±5%	0,125W	SMD	3513 999 80048	
R245-248						Not Used
R249	10k	±5%	0,125W	SMD	3513 999 80048	
R250-271						Not Used
R272-274	10k	±5%	0,125W	SMD	3513 999 80048	
R275,276						Not Used
R277	10k	±5%	0,125W	SMD	3513 999 80048	
R278	2k2	±5%	0,125W	SMD	3513 999 80040	
R279	10k	±5%	0,125W	SMD	3513 999 80048	
R280-283						Not Used
R284	2k2	±5%	0,125W	SMD	3513 999 80040	
R285	10k	±5%	0,125W	SMD	3513 999 80048	
R286	100k	±5%	0,125W	SMD	3513 999 80060	
R287	10k	±5%	0,125W	SMD	3513 999 80048	
R288	100k	±5%	0,125W	SMD	3513 999 80060	
R289-293						Not Used
R294-297	10k	±5%	0,125W	SMD	3513 999 80048	
R298,299	100k	±5%	0,125W	SMD	3513 999 80060	
R300-314						Not Used
R315	100k	±5%	0,125W	SMD	3513 999 80060	
R316	10k	±5%	0,125W	SMD	3513 999 80048	
R317	100k	±5%	0,125W	SMD	3513 999 80060	
R318						Not Used
R319-324	10k	±5%	0,125W	SMD	3513 999 80048	
R325-332						Not Used
R333	100k	±5%	0,125W	SMD	3513 999 80060	
R334	2k2	±5%	0,125W	SMD	3513 999 80040	
R335-337						Not Used
R338	10k	±5%	0,125W	SMD	3513 999 80048	
RN1	10k	±5%	9-pin SIL		RN99528	
RN2	2k2	±5%	9-pin SIL		RN99526	
RN3-6	10k	±5%	6-pin SIL		RN99368	
RV1	100k	±20%	Pot skel lin		PL99016	
RV2	10k	±20%	Pot skel lin		PL01478	
RV3						Not Used
RV4	1k	±20%	Pot cermet lin		PL99016	
Capacitors						
C1-4						Not Used
C5	56n	±10%	50V	SMD	3513 999 55014	
C6	12n	±10%	50V	SMD	CN99115	
C7	10	±20%	50V	elec	PS99436	
C8,9	56n	±10%	50V	SMD	3513 999 55014	
C10	12n	±10%	50V	SMD	CN99115	
C11	56n	±10%	50V	SMD	3513 999 55014	
C12	0µ22		50V	elec	PS99865	
C13,14	10	±20%	50V	elec	PS99436	
C15-20						Not Used
C21	100	±20%	25V	elec	PS99424	
C22,23	100n	±10%	50V	SMD	3513 999 55017	
C24-80						Not Used
C81	10n	±10%	50V	SMD	3513 999 55471	
C82-84	1n	±10%	50V	SMD	3513 999 55459	
C85-87	10n	±10%	50V	SMD	3513 999 55471	
C88	1n	±10%	50V	SMD	3513 999 55459	
C89-92	10n	±10%	50V	SMD	3513 999 55471	
C93	1n	±10%	50V	SMD	3513 999 55459	
C94,95	10n	±10%	50V	SMD	3513 999 55471	
C96						Not Used
C97-101	10n	±10%	50V	SMD	3513 999 55471	
C102	1n	±10%	50V	SMD	3513 999 55459	
C103-107	10n	±10%	50V	SMD	3513 999 55471	
C108	1n	±10%	50V	SMD	3513 999 55459	
C109-117	10n	±10%	50V	SMD	3513 999 55471	
C118						Not Used
C119-121	56n	±10%	50V	SMD	3513 999 55014	
C122-127						Not Used
C128	1	±20%	100V	elec	PS99455	
C129-133						Not Used
C134	100n	±10%	50V	SMD	3513 999 55017	
C135-136						Not Used
C137	10	±20%	50V	elec	PS99436	

Cct. Ref	Description				Part No.	Remarks
Capacitors Cont'd						
C138						Not Used
C139-141	56n	±10%	50V	SMD	3513 999 55014	
C142						Not Used
C143-150	33p	±5%	50V	SMD	3513 999 55319	
C151-204						Not Used
C205-207	56n	±10%	50V	SMD	3513 999 55014	
C208-210						Not Used
C211	1n	±10%	50V	SMD	3513 999 55459	
C212						Not Used
C213	1n	±10%	50V	SMD	3513 999 55459	
C214-218						Not Used
C219	1n	±10%	50V	SMD	3513 999 55459	
C220-223						Not Used
C224-226	1n	±10%	50V	SMD	3513 999 55459	

Miscellaneous

LED1-10	LED red	FV05860	
TP1-3	Header str male 1 pos'n	3513 504 00121	1/P1,2,5-11,14,15,19,20
	Header str male 2 pos'n	FC00837/02	1/P3&4,12&13,17&18,27&28
	Header str male 3 pos'n	FC00837/03	1/LK2,4-9,11,12,25,P21&22&23
	Header str male 15 pos'n	FC00837/15	LK1
	Plug, PCB mounted str 2 x 3	FP99174	LK30
	Plug, PCB mounted str 2 x 9	FP99176	LK3
	Plug, PCB mounted str 2 x 4	FP99196	LK10
	Plug, PCB mounted str 2 x 15	FP99296	LK1
PLB	Plug D type 37-way	FP99028	
PLC	Header less ears 16 pos'n	FP99221	
SKA	Conn. double row 2 x 17 pos,n	FC03608/17	Mates with PLA on front panel
SKD	Conn. female socket 40 pos'n	FS99191	
	Cable, 40-way ribbon IDC	FC99205	
	Connector PCB solder 40 pos'n	FP99155	
	Link connector	FC99060	
	Heatsink twisted vane	QA05850	1/IC48
	Nut st hex M3	QA11605/X	1/IC48 - heatsink, 2/PLB
	Washer st M3	QA15005/X	2/PLB
	Bush insulating (TO-220)	QA99024	2/IC48
	Washer thermal (TO-220)	QA99111	1/IC48
	Scr st pan pozi M3 x 8mm	QJ11902/X	2/PLB
	Scr st pan pozi M3 x 10mm	QJ11903/X	1/IC48 - heatsink

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Semiconductors and IC's

IC1-27			Not Used
IC27	IC 4069UB	FU99472/SM	
IC28			Not Used
IC29	IC 4018B	FU99442/SM	
IC30			Not Used
IC31-39	IC quad op amp LM348	3513 999 45003	
IC40			Not Used
IC41	IC dual op amp MC1458D	3513 999 45004	
IC42			Not Used
IC43,44	IC 4066B	3513 999 35019	
IC45			Not Used
IC46	IC 4053B	FU99483/SM	
IC47	IC dual op amp MC1458D	3513 999 45004	
TR1-7			Not Used
TR8	Transistor BCX17	3513 999 00004	
TR9	Transistor BCX19	FV99102/SM	
TR10	Transistor BSR58	FV99156/SM	
TR11	Transistor BCX19	FV99102/SM	
TR12,13			Not Used
TR14,15	Transistor BCX19	FV99102/SM	
TR16,17			Not Used
TR18	Transistor BCX19	FV99156/SM	
D1-3			Not Used
D4	Diode BAW56	FV99061/SM	
D5,6	Diode BAV99	3513 999 15002	
D7,8			Not Used
D9,10	Diode BAV99	3513 999 15002	

Cct. Ref	Description				Part No.	Remarks
Resistors						
R1-27						Not Used
R28	100k	±5%	0,125W	SMD	3513 999 80060	
R29-83						Not Used
R84	1M	±5%	0,125W	SMD	3513 999 80072	
R85,86	470k	±5%	0,125W	SMD	CL99068	
R87						Not Used
R88	22k	±2%	0,25W	m film	PM99314	
R89	100k	±2%	0,25W	m film	PM99330	
R90	100k	±5%	0,125W	SMD	3513 999 80060	
R91	100k	±2%	0,25W	m film	PM99330	
R92	47k	±5%	0,125W	SMD	3513 999 80056	
R93,94	22k	±5%	0,125W	SMD	3513 999 80052	
R95-97	100k	±5%	0,125W	SMD	3513 999 80060	
R98	22	±5%	0,125W	SMD	3513 999 80016	
R99	47	±5%	0,125W	SMD	3513 999 80020	
R100,101						Not Used
R102	2k2	±2%	0,25W	m film	PM99290	
R103	100k	±5%	0,125W	SMD	3513 999 80060	
R104	68k	±2%	0,25W	m film	PM99326	
R105	2k2	±2%	0,25W	m film	PM99290	
R106	56k	±2%	0,25W	m film	PM99324	
R107	100k	±5%	0,125W	SMD	3513 999 80060	
R108	4k7	±5%	0,125W	SMD	3513 999 80044	
R109	100k	±5%	0,125W	SMD	3513 999 80060	
R110	15k	±2%	0,25W	m film	PM99310	
R111	2k2	±5%	0,125W	SMD	3513 999 80040	
R112	100k	±5%	0,125W	SMD	3513 999 80060	
R113	22k	±5%	0,125W	SMD	3513 999 80052	
R114	8k2	±5%	0,125W	SMD	3513 999 80047	
R115,116	2k7	±5%	0,125W	SMD	3513 999 80041	
R117	8k2	±5%	0,125W	SMD	3513 999 80047	
R118	3k6	±2%	0,25W	m film	PM99295	
R119	12k	±2%	0,25W	m film	PM99308	
R120	4k7	±2%	0,25W	m film	PM99298	
R121	56k	±5%	0,125W	SMD	3513 999 80057	
R122	27k	±5%	0,125W	SMD	3513 999 80053	
R123	33k	±5%	0,125W	SMD	3513 999 80054	
R124	30k	±2%	0,25W	m film	PM99317	
R125	33k	±2%	0,25W	m film	PM99318	
R126	10k	±2%	0,25W	m film	PM99306	
R127	39k	±2%	0,25W	m film	PM99320	
R128	11k	±2%	0,25W	m film	PM99307	
R129	22k	±2%	0,25W	m film	PM99314	
R130	15k	±2%	0,25W	m film	PM99310	
R131	12k	±2%	0,25W	m film	PM99308	
R132						Not Used
R133	12k	±2%	0,25W	m film	PM99308	
R134	100k	±5%	0,125W	SMD	3513 999 80060	
R135,136						Not Used
R137	1k	±2%	0,25W	m film	PM99282	
R138,139						Not Used
R140	1k	±2%	0,25W	m film	PM99282	
R141,142						Not Used
R143,144	12k1	±1%	0,25W	m film	PL99099	/01
R145	10k	±1%	0,25W	m film	PL99098	/01
R146	8k66	±1%	0,25W	m film	PL45273	/01
R147	2k2	±2%	0,25W	m film	PM99290	/01
R148	2k2	±2%	0,25W	m film	PM99290	
R149						Not Used
R150,151	12k1	±1%	0,25W	m film	PL99099	/01
R152	10k	±1%	0,25W	m film	PL99098	/01
R153	8k66	±1%	0,25W	m film	PL45273	/01
R154	47k	±2%	0,25W	m film	PM99322	
R155	120k	±2%	0,25W	m film	PM99332	
R156	220	±5%	0,125W	SMD	3513 999 80028	
R157	6k8	±5%	0,125W	SMD	3513 999 80046	
R158	100k	±5%	0,125W	SMD	3513 999 80060	
R159	10k	±5%	0,125W	SMD	3513 999 80048	
R160	620	±2%	0,25W	m film	PM99277	
R161	560	±5%	0,125W	SMD	3513 999 80033	
R162-164	47k	±5%	0,125W	SMD	3513 999 80056	
R165	1k	±5%	0,125W	SMD	3513 999 80036	
R166	15k	±5%	0,125W	SMD	3513 999 80050	
R167	2k2	±5%	0,125W	SMD	3513 999 80040	
R168	470k	±5%	0,125W	SMD	CL99068	

Cct. Ref	Description				Part No.	Remarks
Resistors (Cont'd)						
R169,170	12k1	±1%	0,25W	m film	PL99099	/01
R171	10k	±1%	0,25W	m film	PL99098	/01
R172	8k66	±1%	0,25W	m film	PL45273	/01
R173	180	±5%	0,125W	SMD	3513 999 80027	
R174	2k7	±5%	0,125W	SMD	3513 999 80041	
R175	100	±5%	0,125W	SMD	3513 999 80024	
R176	27k	±5%	0,125W	SMD	3513 999 80053	
R177	18k	±2%	0,25W	m film	PM99312	/01
R178						Not Used
R179	47k	±5%	0,125W	SMD	3513 999 80056	
R180	8k2	±5%	0,125W	SMD	3513 999 80047	
R181	2k2	±5%	0,125W	SMD	3513 999 80040	
R182,183	22k	±5%	0,125W	SMD	3513 999 80052	
R184	127k	±1%	0,25W	m film	PL51200	/01
R185,186	90k9	±1%	0,25W	m film	PL45368	/01
R187	127k	±1%	0,25W	m film	PL51200	/01
R188	8k2	±5%	0,125W	SMD	3513 999 80047	
R189	120k	±5%	0,125W	SMD	3513 999 80061	
R190	10k	±5%	0,125W	SMD	3513 999 80048	
R191,192	27k	±5%	0,125W	SMD	3513 999 80053	
R193	10k	±5%	0,125W	SMD	3513 999 80048	
R194	33k	±5%	0,125W	SMD	3513 999 80054	
R195	39k	±5%	0,125W	SMD	3513 999 80055	
R196,197						Not Used
R198	18k	±5%	0,125W	SMD	3513 999 80051	
R199	10k	±5%	0,125W	SMD	3513 999 80048	
R200-203	10	±5%	0,125W	SMD	3513 999 80012	
R204	18k	±5%	0,125W	SMD	3513 999 80051	
R205	10k	±5%	0,125W	SMD	3513 999 80048	
R206	100	±5%	0,125W	SMD	3513 999 80024	
R207	27	±2%	0,25W	m film	PM99244	
R208	110	±2%	0,25W	m film	PM99259	
R209	470	±2%	0,25W	m film	PM99274	
R210	18k	±5%	0,125W	SMD	3513 999 80051	
R211	24k	±2%	0,25W	m film	PM99315	
R212						Not Used
R213	1k	±2%	0,25W	m film	PM99282	
R214	1k	±2%	0,25W	m film	PM99282	
R215	1k	±2%	0,25W	m film	PM99282	
R216						Not Used
R217	1	±5%	0,25W	c film	PM01400	
R218	1k5	±2%	0,25W	m film	PM99286	
R219	47k	±2%	0,25W	m film	PM99322	
R220	120k	±2%	0,25W	m film	PM99332	
R221	27k	±2%	0,25W	m film	PM99316	
R222	13k	±2%	0,25W	m film	PM99309	
R223	39k	±2%	0,25W	m film	PM99320	
R224	16k	±2%	0,25W	m film	PM99311	
R225	47k	±5%	0,125W	SMD	3513 999 80056	
R226	120k	±5%	0,125W	SMD	3513 999 80061	
R227,228	12k1	±1%	0,25W	m film	PL99099	/01
R229	10k	±1%	0,25W	m film	PL99098	/01
R230	8k66	±1%	0,25W	m film	PL45273	/01
R231	6k8	±5%	0,125W	SMD	3513 999 80046	
R232	1k5	±5%	0,125W	SMD	3513 999 80038	
R233-236						Not Used
R237	47k	±5%	0,125W	SMD	3513 999 80056	
R238-244						Not Used
R245	100	±5%	0,125W	SMD	3513 999 80024	
R246	10k	±5%	0,125W	SMD	3513 999 80048	
R247-254						Not Used
R255	10k	±5%	0,125W	SMD	3513 999 80048	
R256	100k	±5%	0,125W	SMD	3513 999 80060	
R257	2k2	±5%	0,125W	SMD	3513 999 80040	
R258						Not Used
R259	100	±5%	0,125W	SMD	3513 999 80024	
R607-264						Not Used
R265	15k	±2%	0,25W	m film	PM99310	
R267,268	10k	±5%	0,125W	SMD	3513 999 80048	
R269	47k	±5%	0,125W	SMD	3513 999 80056	
R270	100	±5%	0,125W	SMD	3513 999 80024	
R271	22k	±2%	0,25W	m film	PM99314	
R272-279						Not Used
R280	100k	±5%	0,125W	SMD	3513 999 80060	
R281	2k2	±5%	0,125W	SMD	3513 999 80040	

Cct. Ref	Description				Part No.	Remarks
Resistors Cont'd						
R282	100k	±5%	0,125W	SMD	3513 999 80060	
R283	1k	±5%	0,125W	SMD	3513 999 80036	
R283-300						Not Used
R301	47k	±5%	0,125W	SMD	3513 999 80056	
R302-308	10k	±5%	0,125W	SMD	3513 999 80048	
R309	1	±5%	0,25W	c film	PM01400	
R310	4k7	±5%	0,125W	SMD	3513 999 80044	
R311,312	10k	±5%	0,125W	SMD	3513 999 80048	
R313	47k	±5%	0,125W	SMD	3513 999 80056	
R314	10k	±5%	0,125W	SMD	3513 999 80048	
R315-324						Not Used
R325-327	10k	±5%	0,125W	SMD	3513 999 80048	
R328-331	100k	±5%	0,125W	SMD	3513 999 80060	
R332	10k	±5%	0,125W	SMD	3513 999 80048	
R333,334						Not Used
R335	91k	±2%	0,25W	m film	PM99329	
R336,337	2k2	±5%	0,125W	SMD	3513 999 80040	
RV1,2						Not Used
RV3	100k	±20%	Pot skel lin		PL99016	
RV5	4k7	±20%	Pot skel lin		PL01486	
RV6	50k	±20%	Pot cermet lin		PL99584	
RV7,8	2k	±20%	Pot encl lin		PL65802	/01
RV9	4k7	±20%	Pot skel lin		PL01486	
RV10	50k	±20%	Pot cermet lin		PL99584	
RV11	2k	±20%	Pot encl lin		PL65802	/01
RV12,13	10k	±20%	Pot skel lin		PL01478	
RV14	50k	±20%	Pot cermet lin		PL99584	
RV15	10k	±20%	Pot encl lin		PL99697	/01
RV16	100k	±20%	Pot skel lin		PL99016	
RV17	2k	±20%	Pot encl lin		PL65802	/01
RN8	100k	±5%	9-pin SIL		RN99531	
Capacitors						
C1-14						Not Used
C15-17	10	±20%	50V	elec	PS99436	
C18	1	±20%	100V	elec	PS99455	
C19,20	100	±20%	25V	elec	PS99424	
C21-23						Not Used
C24	2n2	±2,5%	100V	pp	PQ99617	
C25						Not Used
C26-29	10	±20%	50V	elec	PS99436	
C30	10n	±2,5%	63V	pp	PQ99621	
C31	680p	±2,5%	100V	pp	PQ99614	
C32	3n3	±2,5%	63V	pp	PQ99618	
C33	1n5	±2,5%	100V	pp	PQ99616	
C34	3n3	±10%	50V	SMD	CN99108	
C35	10	±20%	50V	elec	PS99436	
C36,37	1	±20%	100V	elec	PS99455	
C38,39						Not Used
C40	2n2	±5%		cer	PN99902	/01
C41	15n	±5%		cer	PN99907	
C42	2n2	±5%		cer	PN99902	/01
C43	15n	±5%		cer	PN99907	/01
C44,45	10n	±10%	50V	SMD	3513 999 55492	
C46,47						Not Used
C48	10n	±10%	50V	SMD	3513 999 55492	
C49	1	±20%	100V	elec	PS99455	
C50-53	10	±20%	50V	elec	PS99436	
C54	1	±20%	100V	elec	PS99455	
C55	15n	±5%		cer	PN99907	/01
C56	2n2	±5%		cer	PN99902	/01
C57	10	±20%	50V	elec	PS99436	/01
C58	10n	±5%		submin pes	PQ99532	
C59	22n	±10%	50V	SMD	3513 999 55496	
C60	56n	±10%	50V	SMD	3513 999 55014	
C61	2n2	±5%	50V	SMD	3513 999 55003	
C62	1n	±5%	50V	SMD	3513 999 55418	
163	56n	±10%	50V	SMD	3513 999 55014	
C64						Not Used
C65	10	±20%	50V	elec	PS99436	
C66	10n	±10%	50V	SMD	3513 999 55492	
C67	1	±20%	100V	elec	PS99455	
C68						Not Used

Cct. Ref	Description				Part No.	Remarks
Capacitors (Cont'd)						
C69	100n	±5%		submin pes	PQ99535	
C70,71	10n	±10%	50V	SMD	3513 999 55492	
C72	10n	±2,5%	63V	pp	PQ99621	
C73	470p	±5%	50V	SMD	3513 999 55414	
C74	3n3	±5%	50V	SMD	CN99154	
C75	1n8	±5%	50V	SMD	CN99058	
C76	100n	±10%	50V	SMD	3513 999 55017	
C77	15n	±5%		cer	PN99907	
C78	2n2	±5%		cer	PN99902	/01
C79	330p	±5%		cer	PN99884	/01
C80	100n	±10%	50V	SMD	3513 999 55017	
C81-117						Not Used
C118	47p	±5%	50V	SMD	CN99039	
C119-121						Not Used
C122	56n	±10%	50V	SMD	3513 999 55014	
C123	3n3	±20%		cer	PN99918	
C124	4µ7	±20%	63V	elec	PS99444	
C125	1n	±5%	50V	SMD	3513 999 55418	
C126	4µ7	±20%	63V	elec	PS99444	
C127	100n	±10%	50V	SMD	3513 999 55017	
C128						Not Used
C129	1	±20%	100V	elec	PS99455	
C130	680p	±5%		cer	PN99888	/01
C131,132						Not Used
C133	1n5	±2,5%	100V	pp	PQ99616	
C134-137						Not Used
C138	1	±20%	100V	elec	PS99455	
C139-150						Not Used
C151-153	33p	±5%	50V	SMD	3513 999 55319	
C154						Not Used
C155	1n	±10%	50V	SMD	3513 999 55459	
C156-159	33p	±5%	50V	SMD	3513 999 55319	
C160-163						Not Used
C164-171	33p	±5%	50V	SMD	3513 999 55319	
C172						Not Used
C173-176	33p	±5%	50V	SMD	3513 999 55319	
C177	1n	±10%	50V	SMD	3513 999 55459	
C178-185	33p	±5%	50V	SMD	3513 999 55319	
C186	1n	±10%	50V	SMD	3513 999 55459	
C187-194	33p	±5%	50V	SMD	3513 999 55319	
C195,196	1n	±10%	50V	SMD	3513 999 55459	
C197,198	33p	±5%	50V	SMD	3513 999 55319	
C199,200						Not Used
C201,202	33p	±5%	50V	SMD	3513 999 55319	
C203	1n	±10%	50V	SMD	3513 999 55459	
C227-229	56n	±10%	50V	SMD	3513 999 55014	
C230,231	33p	±5%	50V	SMD	3513 999 55319	
C232	470n	±10%	35V	tant SMD	CS99388	
Miscellaneous						
XL1	Crystal 29700Hz				FC06154	/01
	Link connector				FC99060	

FRONT PANEL PCB ASSEMBLY
AT28997/01

Semiconductors & IC's		
IC1	IC4001	FU99060
IC2	IC Dual op amp 1458	FU99092
TR1-6	Transistor BC547B	FV05891
D1-4	Diode 1N4148	FV05808
D5	Diode 8V2 ±5%	FV05970

Resistors					
R1-3	100k	±5%	0,25W	c film	PM01460
R4	10k	±5%	0,25W	c film	PM01448
R5,6	100k	±5%	0,25W	c film	PM01460
R7-15	10k	±5%	0,25W	c film	PM01448
R16	220	±5%	0,25W	c film	PM01428
R17-22	1k	±5%	0,25W	c film	PM01436
R23,24	100k	±5%	0,25W	c film	PM01460

Cct Ref	Description				Part No	Remarks
Resistors (Cont'd)						
R25	47k	±5%	0,25W	c film	PM01456	
R26	100k	±5%	0,25W	c film	PM01460	
R27	330	±5%	0,25W	c film	PM01430	
R28	100k	±5%	0,25W	c film	PM01460	
R29	4k7	±5%	0,25W	c film	PM01444	
Capacitors						
C1-3	4µ7	±20%	63V	elec	PS99444	
C4-7	100n	±20%		cer	PN99927	
C8,9	4µ7	±20%	63V	elec	PS99444	
C10	100n	±20%		cer	PN99927	
C11	4µ7	±20%	63V	elec	PS99444	
C12,13	33p	±5%		cer	PN99872	
C14-21						Not Used
C22	10n	±20%		cer	PN99921	
C23	1n	±20%		cer	PN99915	
C24	10n	±20%		cer	PN99921	
C25	1n	±20%		cer	PN99915	
C26,27	10n	±20%		cer	PN99921	
C28						Not Used
C29-37	10n	±20%		cer	PN99921	
C38	1n	±20%		cer	PN99915	
C39,40	10n	±20%		cer	PN99921	
C41	1n	±20%		cer	PN99915	
C42-48	10n	±20%		cer	PN99921	
C49-52	1n	±20%		cer	PN99915	
C53-59	10n	±20%		cer	PN99921	
Miscellaneous						
PLA	Plug PCB mtd Straight 2 x 17				FP99188	
PLB	Header, less ears 20 pos'n				FP99222	
PLC	Plug PCB mtd Straight 2 x 4				FP99196	
PLD	Plug PCB mtd Straight 2 x 2				FP99172	
LK1	Header straight male 3 pos'n				FC00837	
	Link connector				FC99060	1/LK1
SA	Switch 6 way 2 pole				FS07159/01	
LED2,4	LED Yellow				FV05930	1/Squelch, 1/T/T
LED3,5,6	LED Red				FV05858	1/Tx on, 1/Alarm, 1/Manual
LED7	LED Green				FV05931	1/Normal
	Spacer, LED 3,5mm x 4,76mm				QA05856	1/LED2-7