OPERATION AND INSTALLATION MANUAL

DETAILS OF THE EQUIPMENT	
PART NUMBER:	**3301**
DESCRIPTION:	**SUBCOM 2000 DIVING BELL EMERGENCY COMMUNICATION SYSTEM MANUAL**

APPROVALS				
ORIGINATOR:	**R HARDIE**			
ENGINEER:				
PRODUCTION:	**R.J HARDIE**			
ISS	**DATE**	**DESCRIPTION**	**BY**	**CHK**
0	29/03/10	DRAFT FOR APPROVAL	RH	
1		RELEASE FOR PRODUCTION		
2				
3				
4				
5				

The latest issue of this document is held in electronic form.
This is available from our website www.sonavision.co.uk

TECHNICAL SUPPORT	
Address	Sonavision LTD, Unit 12 Energy Development Centre, Aberdeen Science and Energy Park, Bridge Of Don, AB23 8GD, Scotland
Telephone	+44 (0)1224 707737
Fax	+44 (0)1224 827290
Email	info@sonavision.co.uk
Website	www.sonavision.co.uk

MAINTENANCE AND WARRANTY POLICY

Sonavision Limited warrants that its products are free from defects at the time of delivery and subject to the conditions listed below, undertakes to repair, or at its option replace, any product found to be defective in material or workmanship within one year after delivery, whichever is less, to the original purchaser by Sonavision Limited or its authorised representative.

CONDITIONS

1. Sonavision Limited must be immediately notified of any suspected defect and if advised by Sonavision Limited, the equipment subject to defect shall be returned to Sonavision Limited, freight prepaid.
2. This warranty does not cover defects which are caused as a result of improper usage, repair, maintenance, alteration or installation unless such activities have been undertaken by Sonavision Limited or its authorised representative.
3. On completion of any warranty work, Sonavision Limited will return the equipment, freight prepaid.
4. Sonavision Limited retains the sole right to accept or reject any warranty claim.

SAFETY AND ENVIRONMENTAL STATEMENT

1. Lethal voltages are exposed within the control unit when the top cover is removed. The unit should always be disconnected from the mains supply before removing or operating any internal components.
2. The unit should be earthed at all times.
3. The unit contains electrostatically sensitive devices (ESSD). Appropriate static protection should be used when handling subassemblies.

RELATED DOCUMENTS

Document Number	Document Title

TABLE OF CONTENTS

SECTION 1 INTRODUCTION

The Subcom 2000 Emergency Bell Communication System is designed primarily for emergency back-up to the umbilical wired communications generally used in diving bell installations and would be used in the event of failure of the wired system. Subcom 2000 is a through water acoustic system and does not rely on the integrity of the bell's umbilical, with its own battery pack being sufficient for twenty hours of operation under normal conditions. The surface receiver unit also has an internal battery pack.

1.1 INITIAL INSPECTION

As soon as the system is unpacked, inspect for any damage that may have occurred during transit. Retain all the packing materials until the inspection is complete. If damage is found, notify the carriers and authorised Sonavision Ltd Representative immediately.

1.2 PHYSICAL CHECK

This check should confirm that there are no damaged connectors, dents or scratches to the undersea units which might result in excessive corrosion or water ingress.

1.3 ELECTRICAL CHECK

Connect the undersea units together as shown in the interconnecting diagram and wire the penetrator cable into the Bell Internal Unit.

Note the tow wire connection to Bell 24V a.c./d.c. supply is not required for operation of voice communication.

The Bell Battery Pack is shipped fully charged and care should be taken to avoid short circuits. Careful attention must be given to the maintenance of the batteries as instructed in Section 7.4, Battery Maintenance.

With the Transducer connected to the Bell External Unit a strong signal should be heard from the loud-speaker on scratching the Transducer surface.

A similar test with the Surface Unit should be conducted.

Final Functional test may be carried out by immersing both sets of transducers in a bucket of water or by smearing the face of each transducer with silicon grease and connect them face to face bonded by the silicon grease. Then verify that two way speech communications is possible.

SECTION 2 SPECIFICATION

Carrier:		25kHz ±0.01%
Transmission Frequency:		25.3 - 29.5kHz
Audio Freq. Bandwidth:		4.2kHz
Modulation:		Single Sideband Suppressed Carrier
Transmit Power:		10 Watts
Receiver Sensitivity:		0.40 uBar
Audio Power:		1 Watt into 8 ohms
Power Requirements:		
Surface Unit:		Internal Battery Pack (rechargeable 115/240V a.c. or 24 Volts d.c.)
Bell Unit:		24V a.c./d.c. or 24V Bell Battery Pack
Standby Current:		80mA
Transmit Current:		0.5 Amp
Transducers:		Polyurethane Encapsulated Pre-stressed Piston
Beam Pattern:		Hemispherical
Depth Rating:		600 metres
Battery Capacity:		
Surface Unit:		20 hours (20% transmit)
Bell Unit:		20 hours (20% transmit)
Dimensions:		
Surface Unit:	Height:	160.0mm
	Width:	520.0mm
	Depth:	310.0mm
	Weight:	16.5kg
Bell Internal Unit:	Height:	160.0mm
	Width:	260.0mm
	Depth:	95.0mm
	Weight:	3.0kg
Bell Battery Pack:	Height:	465.0mm
	Diameter:	152.0mm

	Weight in Air:	11.0kg
	Weight in Water:	3.5kg
Bell External Unit:	Height:	65.0mm
	Diameter:	52.0mm
	Weight in Air:	8.0kg
	Weight in Water:	1.5kg
Bell Transducer:	Height:	125.0mm
	Diameter:	60.0mm
	Weight in Air:	1.5kg
	Weight in Water:	0.5kg

SECTION 3 **SYSTEM COMPONENTS**

3.1	SURFACE UNIT:		Model 3301
	a)	Hand Microphone:	Model 3301-1004
	b)	Charge/Monitor Cable:	Model 3301-2001
	c)	Tape/Unscrambler Cable Assembly:	Model 3301-2002
	d)	27kHz Transducer Assembly:	Model 3090
	e)	Boom Headset:	Model 3260 (optional)
3.2	BELL INTERNAL UNIT:		Model 3303
3.3	BELL EXTERNAL UNIT:		Model 3302
	a)	Transducer Assembly:	Model 3091
	b)	R/A Penetrator Cable Assembly:	Model 3400-2001 (optional)
	c)	Straight Penetrator Cable Assy:	Model 3400-2002 (optional)
3.4	BELL BATTERY PACK:		Model 3255
	a)	Power Cable Assembly:	Model 3255-2001
3.5	STROBE LIGHT ASSEMBLY:		Model 3261 (optional)
	a)	Strobe Light Cable Assembly:	Model 3261-2001

(A dummy connector will be supplied to cover the unused battery terminals if a Strobe Light is not used).

SECTION 4 SYSTEM DESCRIPTION

4.1 OVERVIEW

The Subcom 2000 System is a wireless acoustic underwater communication system designed for emergency backup communications between a Diving Bell and its surface support.

The communications system operates as standard on 27kHz SSBSC, compatible with present submersible equipment.

Transmit power is 10 Watts rms on communications.

All bell electronics and batteries are housed in an external pressure housing, which results in greater safety and increased reliability as helium ingress cannot occur and high internal humidity problems do not exist. Only a minimum amount of bell-space is occupied by the small Bell Internal Unit which houses an 8 ohm loudspeaker which also serves as a microphone.

The Surface Unit is provided with a variable squelch control for use in noisy environments. This facility also helps to conserve battery power.

Automatic gain control is provided on both Surface and Bell Units, with manual variation of gain also being possible on the Surface Unit.

The system also features the normal advantages of Single Sideband Suppressed Carrier working (SSBSC) as opposed to Double Sideband (DSB). For the same audio bandwidth the noise bandwidth is halved giving a 3dB reduction in noise in an SSBSC system. Additionally, all the transmitted power is audio information in SSBSC system, whereas in a DSB system half the power is wasted in transmitting an additional sideband containing no extra information.

The Surface Unit contains an internal 24V rechargeable battery pack and integral charger unit. The batteries may be charged through the charge input socket. This should not be connected during normal operation as it will reduce the transmitted power.

The Bell Unit has an external 24V battery pack which can be recharged by the charger provided. This should be done by disconnecting the cable between the Bell Battery Pack and the Bell External Unit at the Electronics Housing and connecting this to the charger.

At monthly intervals allow both surface and subsea battery packs to fully discharge by leaving the systems switched on. The subsea battery may be discharged more quickly be connecting a 22 ohm wire-wound resistor (rated at 50 Watts and mounted on a metal heatsink) to the battery for up to four hours

depending on the initial state of charge. Discharge ought to be stopped when the voltage reaches 20 Volts. Take care not to leave such a load connected after normal discharge, otherwise the battery pack may be driven into DEEP DISCHARGE and be PERMANENTLY DAMAGED.

4.2 CONTROLS - BELL INTERNAL UNIT

VOLUME: This control is used to switch ON the Bell Unit communications and the Strobe Light and to vary the volume of the received communications. When switched on the unit is normally on receive.

PTT: This control when depressed, switches the Bell Unit to transit mode, enabling speech to be input to the Bell Internal Unit speaker which is configured as a microphone.

STANDBY: In the UP position, this switch allows normal received operation of the system to be controlled by the ON/OFF VOLUME control. In the STANDBY position, it enables the Power Fail Detect Circuit to operate. This facility monitors the bell supply (24V d.c. or a.c.), so that if a power fail occurs, the Bell Unit is automatically activated giving communications and strobe.

NOTE: If the Bell supply is not connected the STANDBY position should not be used.

PING AUX: In the ON position, this switch will enable the auxiliary emergency systems optional Strobe Light to be activated when either:

a) The communications channel is opened up by virtue of the power fail detection circuitry operating.

b) The ON/OFF VOLUME control is turned to the ON position. In the OFF position the Strobe is disabled.

AUX SPEAKER: This is a jack socket which when utilised will disconnect the speaker mounted in the control box and allow another suitable loudspeaker of 8 ohms impedance to be connected.

BELL SUPPLY: This is a gland situated on the side of the Bell Internal Unit which allows entry of the 24V supply required by the power fail detect circuitry. This is purely a monitoring function and is not required to power the Bell System. The External Battery Pack is supplied to power the system since the effects of supply-borne interference is minimised and battery capacity can be more accurately estimated with only one power supply.

4.3 CONTROLS - SURFACE UNIT

FUSE: Holder for system main fuse 1.25 inch 5 amp.

VOLUME: This acts as the overall system power switch and speech volume control. When switched on the unit is normally on receive.

GAIN: Controls gain of high frequency front end stage. Under normal conditions the switched AGC position should be employed.

SQUELCH: Variable squelch control which can be disabled. This should be adjusted to give no loud background noise in receive mode except during voice transmission from Bell Unit.

PING Rx: Not Used.

PTT: With SPEAKER/HEADSET switch set for SPEAKER this control switches the Surface Unit to transmit mode enabling speech to be input to the integral loudspeaker which is configured as a microphone.

SPEAKER/HEADSET: Controls type of speaker/microphone configuration. SPEAKER position should be selected when using a fist microphone with integral PTT switch and internal loud-speaker. HEADSET position should be selected when using headset with combined boom microphone and cable PTT switch.

HEADSET/ MICROPHONE Connector for microphone or headset.

TRANSDUCER: Connector for 27kHz Surface Transducer.

TAPE/UNSC.: Connector for direct output of transmitted and received speech, suitable for tape recording or connection to a helium speech unscrambler.

CHARGE: Connector for mains or 24V d.c. battery charging supply input.

PING TDCR: Not Used.

4.4 THEORY OF OPERATION

The basic circuitry of the Subcom 2000 System is identical for both Surface and Bell Units and the following technical description will apply to both units.

The Subcom 2000 is an SSBSC transceiver operating on the upper sideband of a 25kHz crystal controlled carrier. The system is composed of five basic units, as follows:

4.4.1 Receiver

Acoustic sound pressure waves are sensed by the Transducer which converts them into electrical energy. These signals are fed to the input of the receiver. The signals are amplified by the high frequency (27kHz) front end section of the receiver. The high frequency section of the receiver contains the automatic gain control (AGC) element of the receiver which will be referred to later. The amplified signal from the high frequency section of the receiver is then connected to the bandpass filter where the signal is band limited to remove noise and provide improved selectivity of received signals.

The signal is then fed to the chopper mixer circuit where it is mixed with a 25kHz signal from the crystal oscillator. This process produces sum and difference frequencies between the received signal and the crystal oscillator. The difference frequency is then filtered out by the lowpass filter which follows the mixer circuit. This audio signal is now coupled to the Preamplifier which, after amplification, couples the signal to the volume control where its level can be adjusted before going to the audio power amplifier and AGC amplifier, which further amplifies the audio signals and converts it to a d.c. level for the purpose of controlling the gain of the receiver high frequency front end.

4.4.2 Transmitter

Upon pressing the PTT switch, audio signals from the device acting as the microphone (ie. a fist microphone loudspeaker or boom microphone) will be coupled to the microphone amplifier circuit. This signal is then mixed with a signal from the crystal

oscillator by the chopper mixer circuit. This produces both an upper and lower sidebands. The bandpass filter then selects the upper sideband signal which is coupled to the power amplifier which drives to the Transducer.

4.4.3 Filter, Mixer and Oscillator

The filter circuits extract the bandwidth of frequencies utilised by the system. These signals are mixed with a 25kHz ±0.01% signal from the oscillator circuit by the mixer circuit.

4.4.4 Voltage Regulator and Electronics Switch Circuits

The voltage regulator produces a 12V regulated level from the 24V unregulated input. The 12V level is fed to the receiver or transmitter by the electronic switch circuit as controlled by the PTT switch. The power amplifier circuit also uses the unregulated 24V supply direct.

4.4.5 Transducer

A bi-directional device used to convert electrical energy into acoustic energy and acoustic energy into electrical energy.

Inadequate separation between Transducers on the ship for communications or any other purpose is the major likely cause of system interference.

SECTION 5 INSTALLATION

5.1 SURFACE UNIT

The Surface Unit is fully self-contained and may be operated from any location on the support vessel.

The charge cable supplied identifies the power connection, and only one of these should be connected as required. (Take great care not to let the free ends of this charging cable short together otherwise damage will be caused to one of the relays in the power module. Keep the leads insulated except when being used).

The TAPE/UNSC cable should be terminated as required for the appropriate equipment used.

Careful consideration should be given to the Surface Transducer deployment, especially with regard to other acoustic transducers on the ship, ie. dynamic positioning systems, echo sounders, etc. The communication transducer should be placed as far from these other sources as physically possible.

The communications transducer (27kHz) should be run out to full cable length and should be at least fifteen metres below the support ship.

5.2 BELL INTERNAL UNIT

The Internal Bell Unit should be mounted by means of the mounting holes provided at about head height within the bell. Connections are required to the Bell External Unit via an 8 way penetrator assembly.

Cable Assembly continuity from the 8 way Kintec should be tested and each termination identified prior to installation. This cable should then be fed into the Bell Internal Unit via the side entry cable gland and terminated as shown on the Subcom 2000 System Bell Equipment Interconnection Diagram.

An auxiliary speaker output is provided by means of a covered jack socket on the unit.

A cable entry gland is provided so that a feed of 24V a.c. or d.c. from the umbilical bell supply can be sensed inside the Bell Internal Unit. This is used to automatically activate the emergency communication circuits and auxiliary systems in the event of this voltage being removed for whatever reason whilst the system is in STANDBY mode. When this occurs, the Strobe Light if fitted will be activated, provided that the PING AUX and STANDBY switches are in the ON position. Signals to the bell will be enabled and low volume speech will be reproduced by the loud-speaker until such time as the volume control is turned up manually. If the system has been turned on in this automatic

manner it is necessary to physically turn the ON/OFF VOLUME control to the ON position before starting to transmit from the Bell Internal Unit.

5.3 BELL EXTERNAL UNIT

The External Electronics Housing (identified by having three bulkhead connectors) should be mounted anywhere suitable on the bell bumper bar with the Bell Battery Pack in a separate housing being located in close proximity. Extreme care should be taken when mounting these units to prevent damage to the anodic coating.

The Transducer should be mounted towards the top of the bell.

The battery unit should be connected to the Electronics Housing via the 3-way Power Cable Assembly provided. The penetrator cable assembly should be connected to the 8-way bulkhead connector, and the transducer to the 4-way bulkhead connector.

The cap screws which secure the lids to the housing should be periodically checked for tightness, particularly after transit.

SECTION 6 COMMISSIONING

Switch the Surface Unit ON, and check that the front panel indicator is illuminated. Turn the squelch control to the OFF position and turn the volume control clockwise. Scratch the 27kHz communications transducer and a scratching sound should be heard from the speaker (or headset if fitted and the SPEAKER/HEADSET switch is in the HEADSET position). Rattling a set of keys near the transducer will produce sufficient acoustic energy to be reproduced quite clearly.

To talk from the Surface Unit to the Bell Unit, put SPEAKER/HEADSET switch to the SPEAKER position and press PTT on the hand microphone to talk. If a headset is being used this switch should be in the HEADSET position.

Transmission can also be achieved by talking into the speaker on the Surface Unit with the switch in the SPEAKER position although the quality and clarity of the communications is degraded when this contingency feature is employed. A spring biased PTT switch is provided on the front panel to enable this facility to be used if required.

SECTION 7 SERVICE

To minimise operational downtime of the system it is recommended the spare parts listed under operational spares be carried on the support vessel while the more comprehensive list of major items should be held at a shore base, where maintenance and repair work is normally undertaken. The third list gives details of some of the more critical components required to maintain full operational status. Reference should be made to the parts list section for comprehensive details of components used.

Extensive stocks of all components used in the Subcom 2000 are held by Stenmar Sonavision Ltd and are available on a twenty-four hour basis as are our fully experienced field service engineers.

7.1 OPERATIONAL SPARES

Part Number	Item
3302	Electronics Unit
3303	Bell Internal Unit
3255	Battery Pack
3255-2001	Power Cable
3090	Surface Transducer
3091	Bell Transducer
3261	Strobe Light Assembly (if fitted)
3261-2001	Strobe Cable (if fitted)

7.2 BASE SPARES - MAJOR ITEMS

Part Number	Item
3301-3001	Tx/Rx Board
3301-3002	Mixer/Oscillator Board
3301-3003	Voltage Regulator Board
3301-3004	Squelch Board
3301-1001	Power Module
3302-01-002	U/W Housing (also used for Battery Pack)
3302-3001	Power Board
3302-3002	Modulator Board
3303-3001	PTT PCB/Switch Assembly
3091	Bell Transducer
3242-3001	Battery Charger Board

7.3 BASE SPARES - COMPONENT PARTS

SURFACE UNIT:

Part Number	Item
0185-1015	Volume/Squelch/Gain Potentiometer

0780-1001	Rechargeable Batteries (two required per system)
0535-1005	Chassis Edge Connector
3303-5001	Loudspeaker
0700-1004	Push to Talk Switch
0355-1009	Output Power Transistor
3301-1004	Hand Microphone
0340-1004	Power/Charge Indicator
0710-1002	Modulation Lamp
0710-1001	Modulation Lamp Holder

ELECTRONICS UNIT:

Part Number	Item
0800-1028	End Cap O-ring (248)
0550-1005	HS04 3BPX Bulkhead Connector
0550-1004	HS04 4BPX Bulkhead Connector
0550-1001	HS06 8BP Bulkhead Connector

BATTERY PACK:

Part Number	Item
0800-1028	End Cap O-ring (248)
0780-1002	Rechargeable Batteries (two per system)
0550-1005	HS04 3BPX Bulkhead Connector (two per system)

BELL INTERNAL UNIT:

Part Number	Item
0185-1015	Volume Potentiometer
0700-1003	Standby Switch
3303-5001	Loudspeaker
0535-1007	Jack Socket
0535-1008	Jack Socket Cover

BATTERY CHARGER:

Part Number	Item
0610-1004	Transformer
0710-1003	Red Indicator
0340-1002	Yellow Indicator
0340-1001	Green Indicator
0680-1001	Current Meter
0700-1003	Power Switch
0550-1005	HS04 3BPX Bulkhead Connector

7.4 BATTERY MAINTENANCE

7.4.1 Surface Unit Batteries

a) Charge for twelve hours from discharge state. Indicated by power ON indicator changing from green to red. Connect charge lead to either mains supply or 24V d.c..

b) The batteries should not be charged with system operating.

c) Normal continuous operation on a fully charged battery should exceed twenty hours.

d) Mains input to the charger's transformer may be selected to be either 115V or 240V a.c. by internally wiring the appropriate tags on the transformer.

7.4.2 Bell Unit Batteries

a) Charge batteries using the constant current charger provided. The required a.c. mains voltage for which the charger's transformer has been set is indicated by a label on the charger case. If required this setting may be changed by internally wiring the appropriate tags on the transformer.

b) Charge batteries for fourteen hours from fully discharged state, and proportionally less from a charged state.

NOTE: The charging rate of 400mA has been chosen such that no damage should occur if the batteries are left on charge for an extended period of time. This serves no useful purpose after the batteries have acquired their full charge and the practice is not advised.

c) Normal continuous operation on a fully charged battery should exceed twenty hours, although this will depend on the amount of time spent transmitting, and on the use of the Strobe Light.

d) Care must be taken to avoid shorting the battery terminals. Should this happen the internal fuses may blow. Replacements are 10 amp, 1.25 inch normal blow fuses. Replacement fuses for the Strobe Light are 1.25 amp, 1.25 inch anti-surge fuses.

e) At regular intervals (two-four weeks) allow batteries to fully discharge to a terminal voltage of 20V. This may be done by leaving the system switched on or by connecting a dummy load of 22 ohms, 50 Watts rating for period of up to four hours. Monitor the terminal voltage of the battery pack and stop discharging when voltage has

fallen to 20V. (The second battery connection provides a convenient voltage monitoring point).

f) Since both terminals on the battery pack are wired in parallel either terminal may be used for charging.

g) The vent valve should be slackened during charge cycles but must be resealed prior to immersion.

PROTECT ANY UNUSED BATTERY TERMINALS WITH A WATERPROOF COVER!

SECTION 8 OPTIONS

8.1 STROBE LIGHT

The Strobe Light option on the Subcom 2000 Bell Emergency System gives a switched strobe facility for emergency location of the bell.

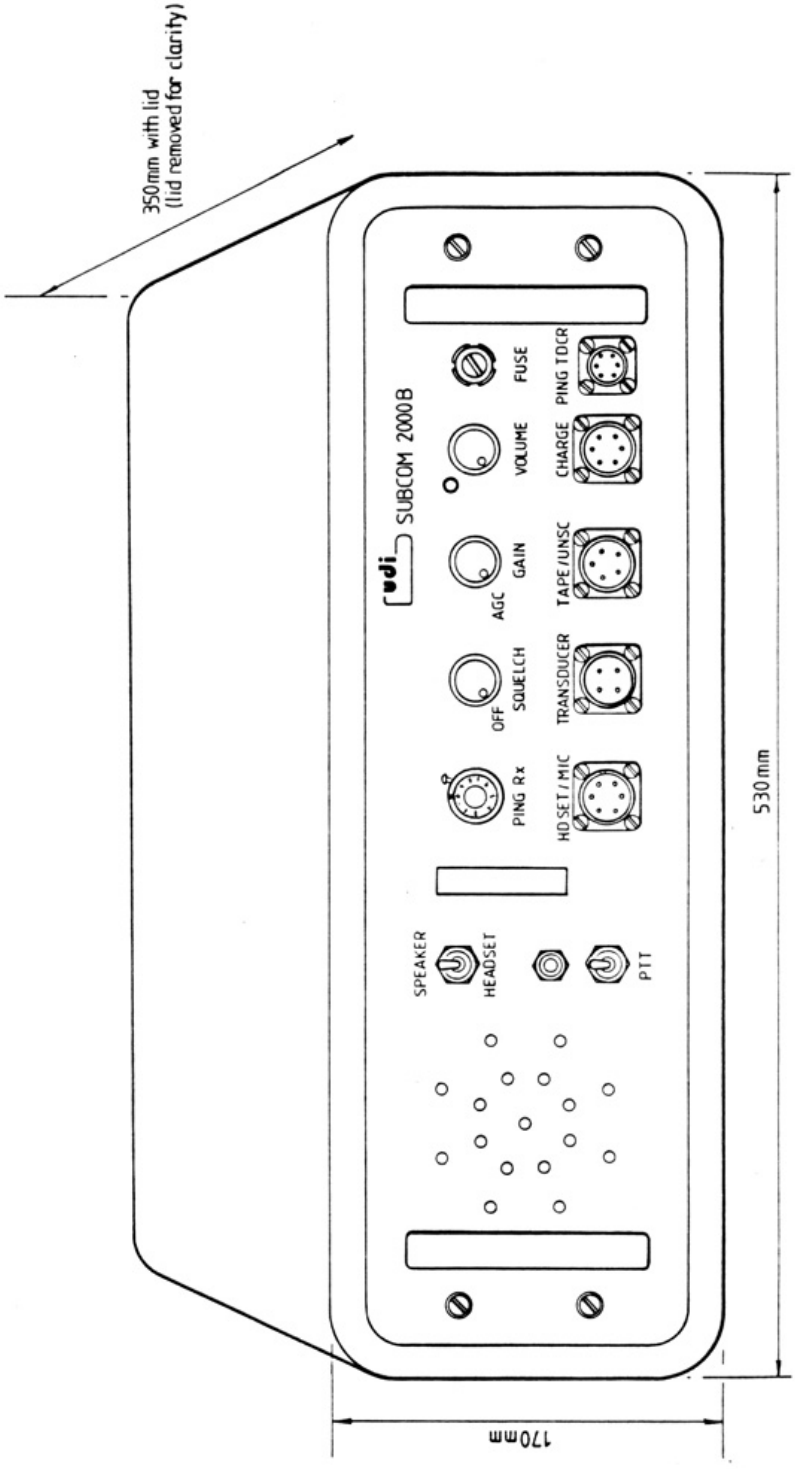
The strobe emits a high powered flash once every three seconds and is powered directly from the system battery pack. It is switchable from inside the bell by means of a switch on the Bell Internal Unit.

To avoid radiation interference it is important that during installations the Strobe Light be separated as much as physically possible from the bell communications transducer.

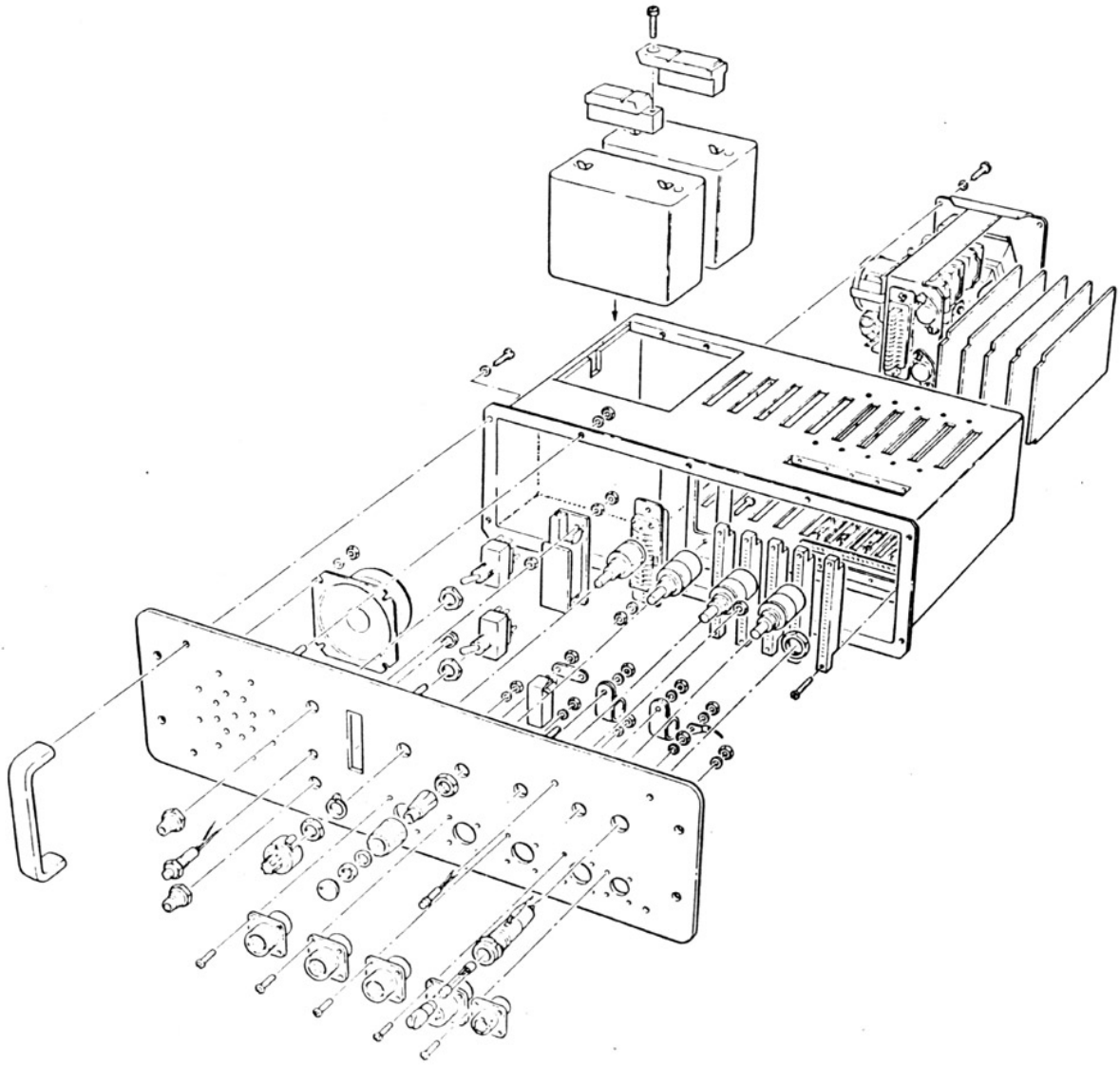
The strobe may be switched off using the PING AUX switch provided on the Bell Internal Unit.

SECTION 9 SYSTEM DIAGRAMS

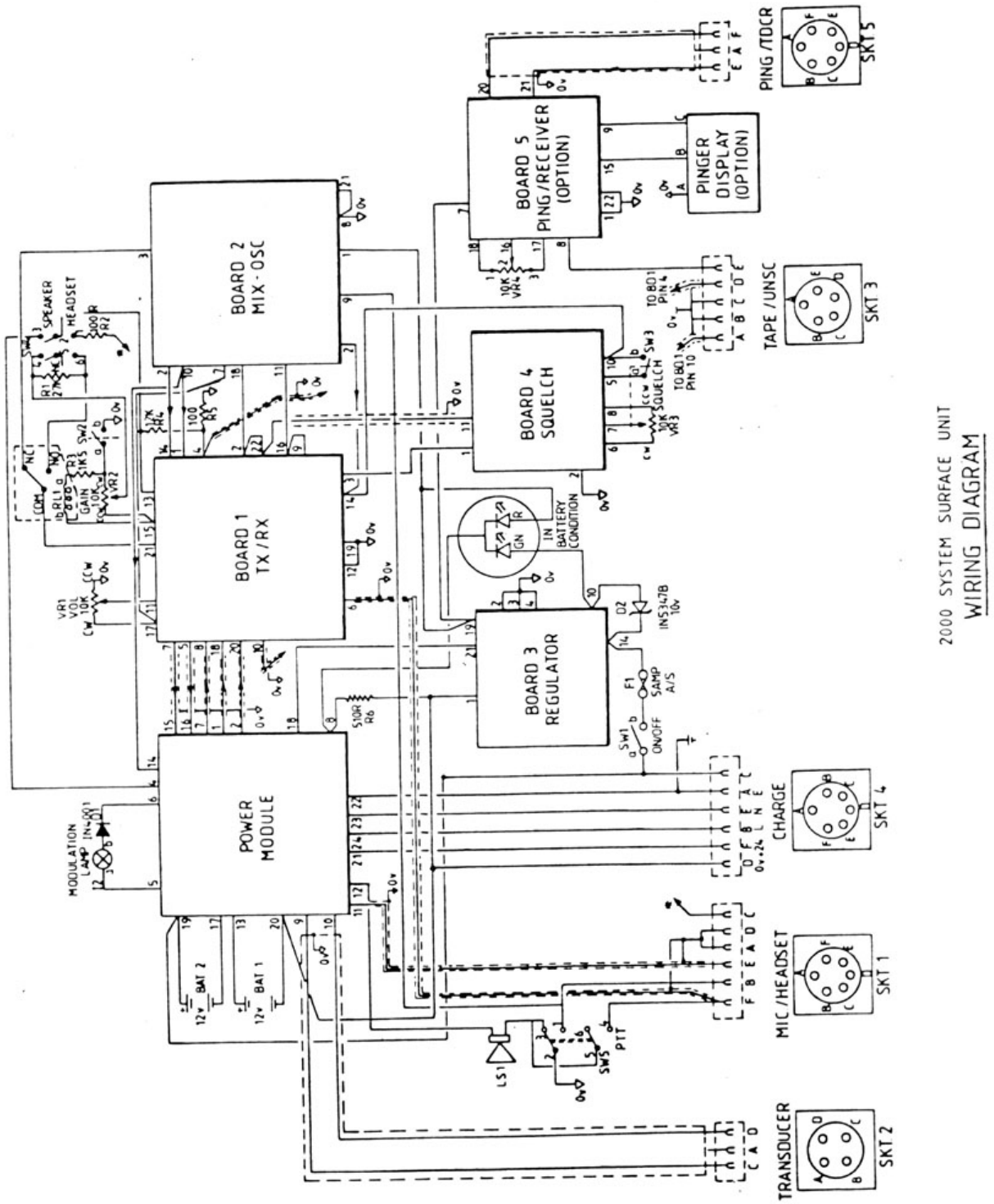
9.1 SURFACE UNIT DRAWINGS

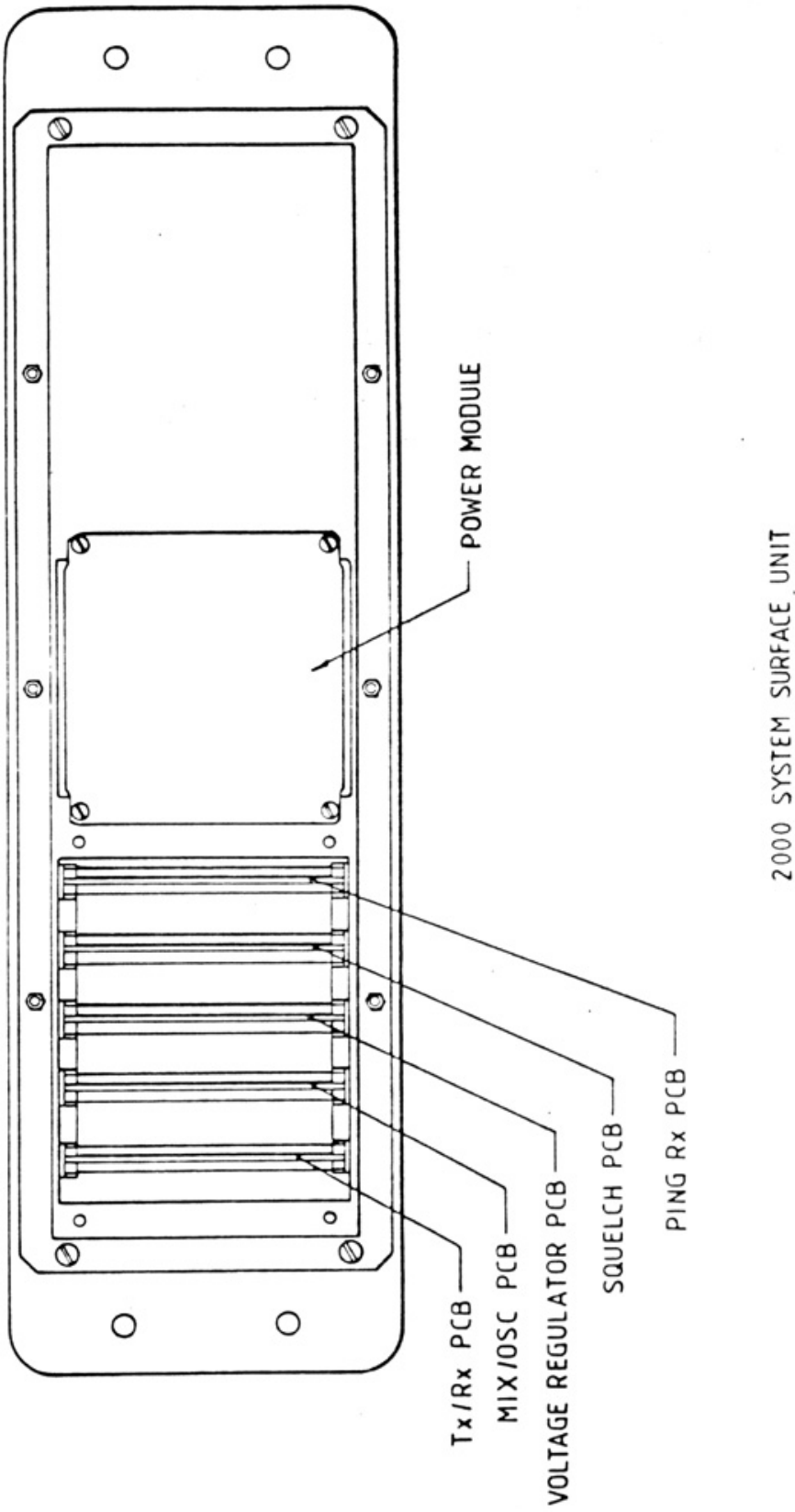


2000 SYSTEM SURFACE UNIT
FRONT VIEW



2000 SYSTEM SURFACE UNIT
ASSEMBLY


2000 SYSTEM SURFACE UNIT
WIRING DIAGRAM
BOARD 1 TX/RX
BOARD 2 MIX-OSC
BOARD 3 REGULATOR
BOARD 4 SQUELCH
BOARD 5 PING/RECEIVER (OPTION)
POWER MODULE
PINGER DISPLAY (OPTION)
PING /TDCR
SKT 5
TAPE /UNSC
SKT 3
CHARGE
SKT 4
MIC /HEADSET
SKT 1
TRANSDUCER
SKT 2
SPEAKER
HEADSET
MODULATION LAMP
BAT 1
BAT 2
PTT
ON/OFF
BATTERY CONDITION
SQUELCH
VOL
GAIN



2000 SYSTEM SURFACE UNIT

REAR VIEW

9.2 BELL UNIT DRAWINGS

9.3 BATTERY CHARGER

SECTION 10 PARTS LISTS

This section details replaceable sub-assemblies of the Subcom 2000 System, followed by tables listing the components for Stenmar Sonavision Ltd manufactured circuit boards. Please quote Stenmar Sonavision Ltd Stock Numbers when ordering components. Figures showing sub-assemblies and component locations are in Section 9.

TABLE 10.1 SURFACE UNIT, SUBASSEMBLIES

Sub-assembly	Stenmar Sonavision Ltd Part Number
Power Module	3301-1001
Rx/Tx Board	3301-3001
Mixer/Oscillator Board	3301-3002
Regulator Board	3301-3003
Squelch Board	3301-3004
12V 4AH Gel Battery (two off)	0780-1001

TABLE 10.2 ELECTRONICS UNIT, COMPONENTS

Sub-assembly	Stenmar Sonavision Ltd Part Number
Housing	3302-01-002
End Cap	3302-01-003
8-way Bulkhead Connector	0550-1001
4-way Bulkhead Connector	0550-1004
3-way Bulkhead Connector	0550-1005
Power Board	3302-3001
Modulator Board	3302-3002
Motherboard	3302-3003
248 O-ring	0800-1028

TABLE 10.3 BATTERY PACK, COMPONENTS

Sub-assembly	Stenmar Sonavision Ltd Part Number
Housing	3302-01-002
End Cap	3255-01-003
Bleed Screw	3255-01-004
3-way Bulkhead Connector (two off)	0550-1005

12V 4AH Battery (two off)	0780-1002
10A 1.25 Fuse	0765-1011
1.25A 1.25 Fuse	0760-1007
248 O-ring	0800-1028
011 O-ring	0800-1005

TABLE 10.4 BELL INTERNAL UNIT, COMPONENTS

Sub-assembly	Stenmar Sonavision Ltd Part Number
PTT Assembly	3303-3001
Loudspeaker	3303-5001
Toggle Switch (two off)	0700-1003
10K Log Pot c/w Switch	0185-1015
2 Pole Jack Socket	0535-1007
Jack Socket Cover	0535-1008
Switch Seal (three off)	0805-1001
Pot Seal	0805-1002

TABLE 10.5 BATTERY CHARGER, COMPONENTS

Sub-assembly	Stenmar Sonavision Ltd Part Number
Charger Board	3242-3001
Toggle Switch	0700-1003
Switch Seal	0805-1001
Panel Meter	0680-1001
3 Way Bulkhead Connector	0550-1005
Green Led	0340-1001
Yellow Led	0340-1002
Red Neon Indicator	0710-1003

TABLE 10.6 POWER MODULE, COMPONENTS

Ref. Number	Description	Part Number	Stock
<u>Resistors</u>			
R1, R2	22R Resistor	W22 OR22	0100-1008
R3	10R Resistor	W22 10R	0115-1009

R4	10R Resistor	WH25 10R	0115-1007
R5	82R Resistor	W21 82R	0110-1004
R6	4K7 Resistor	MR25 4K7	0100-1072
Capacitors			
C1	0.1uF 250V Polyester Capacitor	368 44104	0250-1007
C2	1000uF 63V Elect. Capacitor	033 18102	0200-1037
Semiconductors			
D1, D3, D4	3A Rectifier Diode	IN5404	0310-1012
D2, D5	1A 50V Silicon Diode	IN4001	0310-1001
Q1, Q2	NPN Power Transistor	2N3055	0355-1009
REC1	1A 400V Bridge Rectifier	W08	0330-1004
Miscellaneous			
T1	Transformer Assembly	-	3301-4001
T2	20VA Transformer	RS207-166	0610-1005
L1	Inductor Assembly	N/A	3301-4002
RL1, RL2	12V 4 Pole Mini Relay	RS348-879	0720-1006
B1, B2	Mini Relay Socket	RS349-068	0720-1007
-	Transistor Holder	-	0395-1006
-	Transistor Insulating Kit	-	0395-1012
TG	Tag Strip	-	0535-1013
PL6	24-way Plug	RP24	0535-1001

TABLE 10.7 Tx/Rx BOARD

Ref. Number	Description	Part Number	Stock
	Blank PCB	-	F008-03-01A
Resistors			

R1, R2	220R Resistor	MR25 220R	0100-1039
R3, R14, R29	68K Resistor	MR25 68K	0100-1101
R4	33K Resistor	MR25 33K	0100-1093
R5	100K Resistor	MR25 100K	0100-1105
R6	2K2 Resistor	MR25 2K2	0100-1064
R7, R10, R16, R31	1K Resistor	MR25 1K	0100-1055
R8, R15, R30	10K Resistor	MR25 10K	0100-1080
R9, R21, R22, R35, R36, R38	100R Resistor	MR25 100R	0100-1031
R11, R13, R26, R28	680R Resistor	MR25 680R	0100-1051
R12	150R Resistor	MR25 150R	0100-1035
R17, R32	3K3 Resistor	MR25 3K3	0100-1068
R18, R33	560R Resistor	MR25 560R	0100-1049
R19, R20	22K Resistor	MR25 22K	0100-1089
R23, R37	1R Resistor	LRIL 1R0	0105-1006
R24	4K7 Resistor	MR25 4K7	0100-1072
R25, R34	15K Resistor	MR25 15K	0100-1085
R27	39R Resistor	MR25 39R	0100-1021
R40	1K5 Resistor	MR25 1K5	0100-1060
R41	82R Resistor	MR25 82R	0100-1029

TABLE 10.7 Tx/Rx BOARD

Ref. Number	Description	Part Number	Stock
<u>Capacitors</u>			
C1,C3,C4, C6,C9,C11-	0.1uF 250V Polyester Capacitor	368 44104	0250-1007

C15,C22,C27, C34			
C2	100pF 100V Ceramic Capacitor	8123Z1000101KO	0240-1007
C5	NOT FITTED		
C7,C18-,C20 C23,C24,C32, C33,C39-,C42	10uF 25V Elect. Capacitor	030 36109	0200-1011
C8,C10,C16, C17,C25,C38	1500pF 100V Ceramic Capacitor	630 19152	0230-1018
C21,C26	470pF 100V Ceramic Capacitor	630 19472	0230-1021
C28	100uF 16V Elect. Capacitor	CEA 10016	0200-1007
C29	2.2uF 63V Elect. Capacitor	030 38228	0200-1028
C30,C35,C37	0.015pF 400V Polyester Capacitor	368 54153	0250-1002
C31	47uF 10V Elect. Capacitor	030 34479	0200-1001
C44	470pF 100V Ceramic Capacitor	630 19471	0230-1015
C45	3300pF 100V Ceramic Capacitor	630 19332	0230-1020
C47	47uF 25V Elect. Capacitor	030 36479	0200-1013
Semiconductors			
D1, D2	Silicon Diode	IN4148	0300-1003
Q1	NPN Silicon Transistor	MPSA 14	0350-1005
Q2, Q4	PNP Silicon Transistor	BCY71	0360-1003
Q3, Q5	NPN Silicon Transistor	BC547B	0350-1003

TABLE 10.7 Tx/Rx BOARD

Ref. Number	Description	Part Number	Stock
Integrated Circuits			
IC1	AGC Amplifier	MC1590G	0420-1016

IC2, IC3	Audio Power Amp	TBA810S	0420-1024
Miscellaneous			
T1, T2	100T;400T N30 Transformer Assembly	N/A	3301-4007
T3	70T;60T N30 Transformer Assembly	N/A	3301-4008

TABLE 10.8 MIXER/OSCILLATOR BOARD

Ref. Number	Description	Part Number	Stock
	Blank PCB	-	F008-03-02A
Resistors			
R1, R11, R13, R22	270R Resistor	MR25 270R	0100-1041
R2, R4	33K Resistor	MR25 33K	0100-1093
R3, R5, R7, R8, R15	1K Resistor	MR25 1K	0100-1055
R6	68K Resistor	MR25 68K	0100-1101
R9	3K3 Resistor	MR25 3K3	0100-1068
R10, R12	6K8 Resistor	MR25 6K8	0100-1076
R14	27K Resistor	MR25 27K	0100-1091
R16, R17, R25, R27	10K Resistor	MR25 10K	0100-1080
R18	22K Resistor	MR25 22K	0100-1089
R19	2K2 Resistor	MR25 2K2	0100-1064
R20	1M Resistor	VR25 1M	0100-1129
R21, R23, R28	100R Resistor	MR25 100R	0100-1031
R24, R29	330R Resistor	MR25 330R	0100-1043

R26	4K7 Resistor	MR25 4K7	0100-1072
Capacitors			
C1, C3	680pF 630V Polystyrene Capacitor	427 46801	0260-1030
C2, C5, C16	NOT FITTED		
C4, C17	0.033uF 400V Polyester Capacitor	368 54333	0250-1004
C6, C12	0.1uF 250V Polyester Capacitor	368 44104	0250-1007

TABLE 10.8 MIXER/OSCILLATOR BOARD

Ref. Number	Description	Part Number	Stock
C7, C11, C13, C14	2.2uF 63V Elect. Capacitor	030 38228	0200-1028
C8	1000pF 250V Polystyrene Capacitor	426 41002	0260-1033
C9, C15	10uF 25V Elect. Capacitor	030 36109	0200-1011
C10	0.047uF 250V Polyester Capacitor	368 44473	0250-1005
Semiconductors			
D1, D4	1A 600V Silicon Rectifier Diode	IN4005	0310-1005
D2	Silicon Diode	IN4148	0300-1003
D3	6.2V Zener Diode	BZX79C6V2	0320-1009
A1, A2	Operational Amp	LM307N	0420-1005
Q1-Q3, Q5, Q6	NPN Silicon Transistor	BC547B	0350-1003
Q4, Q7	PNP Silicon Transistor	2N5193	0365-1005
Miscellaneous			
L1, L3	N22 Inductor Assembly	N/A	3301-4004
L2, L5	NOT FITTED		

L4	0.25mm Inductor	N/A	3301-4006
L6	0.125mm Inductor	N/A	3301-4005
Y1	25.0kHz Crystal	NE6SSXY	0480-1002
-	Terminal Pin	18 0218B	0540-1002

TABLE 10.9 REGULATOR BOARD

Ref. Number	Description	Part Number	Stock
	Blank PCB	-	9000-3081F
Capacitors			
C1,C2,C5,C6	1.0uF 50V Multilayer Capacitor 0240-1028	MR065E105MNA	
C3,C4,C7,C8	0.1uF 250V Polyester Capacitor	368 44104	0250-1007
C9	470uF 40V Elect. Capacitor	032 17471	0200-1026
C10	1uF 35V Tantalum Capacitor	TAP1.0M35	0210-1007
C11	0.1uF 35V Tantalum Capacitor	TAP0.1M35	0210-1001
Semiconductors			
D1	1A 600V Rectifier Diode	IN4005	0310-1005
D2-D4	3A 400V Silicon Rectifier Diode	IN5404	0310-1012
Q1	12V Voltage Regulator	78H12	0425-1019
Miscellaneous			
L1, L2	20T Inductor Assembly	N/A	3301-4003
HS1	TO3 14° c/w Heatsink	3SA015	0395-1005
-	TO3 Insulating Kit	170-645	0295-1012

TABLE 10.10 SQUELCH BOARD

Ref. Number	Description	Part Number	Stock
	Blank PCB	-	9000-3082D
Resistors			
R1	2M2 Resistor	VR25 2M2	0100-1133
R2	270R Resistor	MR25 270R	0100-1041
R3	27K Resistor	MR25 27K	0100-1091
R4	47K Resistor	MR25 47K	0100-1097
R5, R6	10K Resistor	MR25 10K	0100-1080
R7	2K2 Resistor	MR25 2K2	0100-1064
R8, R9	1K5 Resistor	MR25 1K5	0100-1060
Capacitors			
C1	0.1uF 250V Polyester Capacitor	368 44104	0250-1007
C2, C4, C5	22uF 35V Tantalum Capacitor	TAP22M35	0210-1015
C3	0.015uF 400V Polyester Capacitor	368 54153	0250-1002
C6	2.2uF 35V Tantalum Capacitor	TAP2.2M35	0210-1009
Semiconductors			
D1, D2	Silicon Diode	IN4148	0300-1003
D3, D4	Germanium Diode	BAT85	0300-1001
D5	1A 50V Silicon Rectifier Diode	IN4001	0310-1001
Q1	N Channel Transistor	2N3819	0370-1001
Q2	NPN Silicon Transistor	BC109	0350-1001
Q3	NPN Silicon Transistor	BFY51	0355-1004
Q4	PNP Silicon Transistor	2N5193	0365-1005

TABLE 10.10 SQUELCH BOARD

Ref. Number	Description	Part Number	Stock
Miscellaneous			
RL1	SPCO Reed Relay	CCPRIJ	0720-1005
L1	82T LA4245 Inductor Assembly 3301-4009		N/A

TABLE 10.11 POWER BOARD

Ref. Number	Description	Part Number	Stock
	Blank PCB	-	9000-3211
Resistors			
R1, R11, R18	4K7 Resistor	MR25 4K7	0100-1072
R2	1M Resistor	MR25 1M	0100-1129
R3	47K Resistor	MR25 47K	0100-1097
R4	10R Resistor	W22 10R	0110-1009
R5	12K Resistor	MR25 12K	0100-1082
R6, R10, R15, R19	10K Resistor	MR25 10K	0100-1080
R7	3K3 Resistor	MR25 3K3	0100-1068
R8	4K3 Resistor	MR25 4K3	0100-1071
R9	2K2 Resistor	MR25 2K2	0100-1064
R12	1R Resistor	CR25 1R0	0105-1006
R13, R14	100K Resistor	MR25 100K	0100-1105
R16, R23	330R Resistor	MR25 330R	0100-1043
R17, R20	100R Resistor	MR25 100R	0100-1031

R21, R22	6K8 Resistor	MR25 6K8	0100-1076
R24, R25	OR22 Resistor	W22 OR22	0110-1008
VR1	5K 20T Potentiometer	43PTO405K0	0150-1006
Capacitors			
C1	0.22uF 35V Tantalum Capacitor	TAP0.22M35	0210-1003
C2	0.47uF 35V Tantalum Capacitor	TAP0.47M35	0210-1005
C3, C5	0.015uF 250V Polyester Capacitor	352 44153	0250-1002
C4	4.7nF 100V Ceramic Capacitor	630 19472	0230-1021

TABLE 10.11 POWER BOARD

Ref. Number	Description	Part Number	Stock
C6,C8,C9, C15,C19,C20, C24,C25,C28, C29	0.1uF 250V Polyester Capacitor	352 44104	0250-1007
C7	0.01uF 250V Polyester Capacitor	352 44103	0250-1001
C10	1uF 35V Tantalum Capacitor	TAP1.0M35	0210-1007
C11	10uF 25V Elect. Capacitor	030 36109	0200-1011
C12	4.7uF 63V Elect. Capacitor	030 38478	0200-1029
C13	0.22uF 250V Polyester Capacitor	352 44224	0250-1009
C14	0.47uF 250V Polyester Capacitor	352 45474	0250-1011
C16	1000pF 160V Polystyrene Capacitor	425 41002	0260-1033
C17, C18	100uF 16V Elect. Capacitor	143 643	0200-1007
C21	470uF 40V Elect. Capacitor	032 17471	0200-1026
C22, C23	1.0uF 50V Multilayer Capacitor 0240-1028	MR065E105MNA	

C26,C27,C31			
C30	1000uF 63V Elect. Capacitor	033 18102	0200-1037
Semiconductors			
D1,D2,D8,D9	Silicon Diode	IN4148	0300-1003
D3	1A 600V Silicon Rectifier Diode	IN4005	0310-1005
D4-D7	3A 400V Silicon Rectifier Diode	IN5404	0310-1012
TR1	NPN Silicon Transistor	2N2222	0350-1006
TR2, TR3	NPN Silicon Transistor	2N3055	0355-1009
TR4, TR5	NPN Silicon Transistor	BC547B	0350-1003
TR6	NPN Silicon Transistor	2N2270	0355-1008

TABLE 10.11 POWER BOARD

Ref. Number	Description	Part Number	Stock
TR7	NPN Silicon Transistor	2N4036	0355-1007
TR8, TR9	PNP Silicon Transistor	2N5193	0365-1005
Integrated Circuits			
IC1	20W Audio Amp	TDA2030H	0420-1025
IC2, IC4	12V 1A Voltage Regulator	MC7812CT	0425-1010
IC3	Dual Timer	NE556N	0420-1022
Miscellaneous			
L1-L3	173T LA1173 Inductor Assy	N/A	3302-4003
T1	13T;80T N30 Transformer Assy	N/A	3302-4001
T2	15T;60T FX3730 Transformer Assembly	N/A	3302-4002
PL1	32-way DIN41612 PCB Plug	100-232-053	0510-1002
FS1	6.3A 20mm Quick Blow Fuse	L1427B/6.3	0755-1014
-	20mm Fuse Clip	412 784	0740-1003

HS1-HS3	PBI 36CB 19° c/w Heatsink	170-070	0395-1004
HS4, HS5	TO30 14° c/w Heatsink	170-079	0395-1005

TABLE 10.12 MODULATOR BOARD

Ref. Number	Description	Part Number	Stock
	Blank PCB	-	9000-3192
Resistors			
R1, R7	6K8 Resistor	MR25 6K8	0100-1076
R2, R6	33K Resistor	MR25 33K	0100-1093
R3,R8,R25, R36,R37,R43, R45,R46,R50	1K Resistor	MR25 1K	0100-1055
R4, R11, R29, R49	68K Resistor	MR25 68K	0100-1101
R5,R9,R33	270R Resistor	MR25 270R	0100-1041
R10	1M Resistor	SFR25 1M	0100-1129
R12, R26	2K2 Resistor	MR25 2K2	0100-1064
R13,R47,R51	3K3 Resistor	MR25 3K3	0100-1068
R14,R17,R18	22K Resistor	MR25 22K	0100-1089
R15,R19, R35,R38,R52	10K Resistor	MR25 10K	0100-1080
R16, R53	560R Resistor	MR25 560R	0100-1049
R20,R21, R34,R40,R44, R55,R63	100R Resistor	MR25 100R	0100-1031
R22,R23, R32,R48,R58, R60	680R Resistor	MR25 680R	0100-1051
R24	150R Resistor	MR25 150R	0100-1035
R27	100K Resistor	MR25 100K	0100-1105

R30, R31	220R Resistor	MR25 220R	0100-1039
R39	27K Resistor	MR25 27K	0100-1091
R41	1K5 Resistor	MR25 1K5	0100-1060

TABLE 10.12 MODULATOR BOARD

Ref. Number	Description	Part Number	Stock
R42, R56	1R Resistor	CR25 1R0	0105-1006
R54, R62	15K Resistor	MR25 15K	0100-1085
R57	82R Resistor	MR25 82R	0100-1029
R59	39R Resistor	MR25 39R	0100-1021
R61	4K7 Resistor	MR25 4K7	0100-1072
Capacitors			
C1	1000pF 160V Polystyrene Capacitor	425 41002	0260-1033
C2	0.047uF 250V Polyester Capacitor	352 44473	0250-1005
C3,C5,C27, C33,C59	2.2uF 35V Tantalum Capacitor	TAP2.2M35	0210-1009
C4,C8,C13, C14,C18,C29, C34,C37,C41, C45,C49,C50, C56,C60,C61	10uF 35V Elect. Capacitor	030 36109	0200-1011
C6,C7,C11, C11,C12,C19, C21,C23,C24, C28,C35,C36, C38-,C40,C42, C47,C53,C55, C62	0.1uF 250V Polyester Capacitor	352 44104	0250-1007
C9,C10,C16, C20,C30,C48	1500pF 100V Ceramic Plate Capacitor	630 06152	0235-1018
C15, C17	4700pF 100V Ceramic Capacitor	630 06472	0230-1021

C22	100pF 160V Polystyrene Capacitor	427 41001	0260-1013
C25, C43	0.033uF 250V Polyester Capacitor	352 44333	0250-1004
C26, C44	680pF 160V Polystyrene Capacitor	427 46801	0260-1030

TABLE 10.12 MODULATOR BOARD

Ref. Number	Description	Part Number	Stock
C31	470pF 100V Ceramic Plate Capacitor	630 06471	0235-1015
C32	3300pF 100V Ceramic Plate Capacitor	630 06332	0235-1020
C46, C51, C58	0.015uF 250V Polyester Capacitor	352 44153	0250-1002
C52, C57	47uF 25V Elect. Capacitor	030 36479	0200-1013
C54	100uF 16V Elect. Capacitor	143 643	0200-1007
C57	47uF 10V Elect. Capacitor	030 34479	0200-1001
Semiconductors			
D1-D3	Silicon Diode	IN4148	0300-1003
D4, D5	1A 50V Silicon Rectifier Diode	IN4001	0310-1001
TR1-TR3, TR6, TR7	NPN Silicon Transistor	BC547B	0350-1003
TR4, TR8	PNP Silicon Transistor	BCY71	0360-1003
TR5	NPN Silicon Transistor	MPSA 14	0350-1005
Integrated Circuits			
IC1, IC2	Operational Amplifier	LM307N	0420-1005
IC3, IC5	Audio Amplifier	TBA810S	0420-1024
IC4	AGC Amplifier	MC1590G	0420-1016

Miscellaneous

RL1, RL2	12V DPCO Relay	KV1002-030	0720-1002
L1, L4	560T N22 Inductor Assembly	N/A	3301-4004
L2	400T N22 Inductor Assembly	N/A	3301-4005
L3	56T N22 Inductor Assembly	N/A	3301-4006
T1, T3	100T;400T N30 Transformer Assembly	N/A	3301-4007

TABLE 10.12 MODULATOR BOARD

Ref. Number	Description	Part Number	Stock
T2	70T;60T N30 Transformer Assy	N/A	3301-4008
XTAL	25.0kHz Crystal	NE6 SSXY	0480-1002
PL1	32-way DIN41612 PCB Plug	100-232-053	0510-1002

TABLE 10.13 MOTHERBOARD

Ref. Number	Description	Part Number	Stock
	Blank PCB	N/A	9000-3193

Miscellaneous

SK	32-way DIN41612 Socket (2)	100-232-451	0510-1001
TP	Turret Pin (16)	140-1969-03-01-00	0540-1003

TABLE 10.14 PTT BOARD

Ref. Number	Description	Part Number	Stock
	Blank PCB	-	9000-3148

Semiconductors			
D1	1A 50V Silicon Rectifier Diode	IN4001	0310-1001
Miscellaneous			
RL1	SPCO Reed Relay	HE721C2410	0720-1004
F1	100mA 20mm Anti-surge Fuse	034-3107	0750-1001
-	20mm Fuse Clips	520-001	0740-1003
TP1-TP4	0.25" PCB Spade Terminal	533-229	0535-1011
SW	4 PDT Biased Toggle Switch	93A520B	0700-1005
T1	30T;690T N30 Transformer	N/A	3303-4001

TABLE 10.15 CHARGER BOARD

Ref. Number	Description	Part Number	Stock
	Blank PCB	-	9500-034
Resistors			
R1	1K2 Resistor	MR25 1K2	0110-1005
R2	NOT FITTED		
R3	2K7 Resistor	MR25 2K7	0100-1066
R4, R11	10K Resistor	MR25 10K	0100-1080
R5	47K Resistor	MR25 47K	0100-1097
R6	160K Resistor	MR25 160K	0100-1110
R7	150K Resistor	MR25 150K	0100-1109
R8, R14	2K2 Resistor	MR25 2K2	0100-1064
R9	22K Resistor	MR25 22K	0100-1089
R10,R12,R13	1K Resistor	MR25 1K	0100-1055
VR1	50K Potentiometer	43PTO4050K	0150-1009
Capacitors			

C1	470uF 63V Elect. Capacitor	CEA 47063	0200-1036
C2	22uF 35V Tantalum Capacitor	TAP22M35	0210-1015
C3, C4	10nF 160V Polystyrene Capacitor	HS10000/160/2.5	0260-1046
C5	2.2uF 35V Tantalum Capacitor	TAP2.2M35	0210-1009
C6	10nF 400V Polyester Capacitor	368 54103	0250-1001
C7, C8	0.1uF 250V Polyester Capacitor	368 44104	0250-1007

TABLE 10.15 CHARGER BOARD

Ref. Number	Description	Part Number	Stock
Semiconductors			
D1-D6	1A 600V Rectifier Diode	IN4005	0310-1005
D7, D8	Silicon Diode	OA202	0310-1004
ZD1	5V1 Zener Diode	BZX79C5V1	0320-1007
ZD2	12V Zener Diode	BZX79C12V	0320-1016
Q1	NOT FITTED		
Q2, Q4	NPN Signal Transistor	BC182L	0350-1002
Q3	PNP Signal Transistor	BC212L	0360-1001
Integrated Circuits			
ICA	IC Timer	NE555N	0420-1021
ICB, ICC	Binary Counter	CD4040BE	0410-1024
Miscellaneous			
TH1	60V Thyristor	C203YY	0390-1001
TB1-TB14	2-way Terminal Block	-	0545-1005

END OF DOCUMENT

SUBCOM 2000B SURFACE UNIT COMPONENT ASSEMBLY

DRAWING NUMBER: 3401-01-005

SUBCOM 2000 SYSTEM SURFACE UNIT "ASSEMBLY"

SUBCOM 2000 SYSTEM SURFACE UNIT "FRONT VIEW"

SUBCOM 2000 SYSTEM SURFACE UNIT "REAR VIEW"

SUBCOM 2000 SYSTEM SURFACE UNIT "WIRING DIAGRAM"

SUBCOM 2000 SYSTEM SURFACE UNIT "TX/RX BOARD"

SUBCOM 2000 SYSTEM SURFACE UNIT "TX/RX BOARD"

SUBCOM 2000 SYSTEM SURFACE UNIT "MIX./OSC. BOARD"

SUBCOM 2000 SYSTEM SURFACE UNIT "MIX./OSC. BOARD"

SUBCOM 2000 SYSTEM SURFACE UNIT "REGULATOR BOARD"

SUBCOM 2000 SYSTEM SURFACE UNIT "REGULATOR BOARD"

SUBCOM 2000 SYSTEM SURFACE UNIT "SQUELCH BOARD"

SUBCOM 2000 SYSTEM SURFACE UNIT "SQUELCH BOARD"

SUBCOM 2000 SYSTEM SURFACE UNIT "POWER MODULE"

SUBCOM 2000 SYSTEM SURFACE UNIT "POWER MODULE"

SUBCOM 2000 SYSTEM BELL EQUIPMENT "ELECTRICAL INSTALLATION"

SUBCOM 2000 SYSTEM BELL EQUIPMENT "INTERCONNECTION DIAGRAM"

SUBCOM 2000 SYSTEM BELL INTERNAL UNIT "FRONT VIEW"

SUBCOM 2000 SYSTEM BELL INTERNAL UNIT "INTERNAL VIEW"

SUBCOM 2000 SYSTEM BELL INTERNAL UNIT "CIRCUIT DIAGRAM"

SUBCOM 2000 SYSTEM BELL INTERNAL UNIT "P.T.T. BOARD"

SUBCOM 2000 SYSTEM BELL EXTERNAL UNIT "ASSEMBLY"

SUBCOM 2000 SYSTEM BELL EXTERNAL UNIT "POWER BOARD"

SUBCOM 2000 SYSTEM BELL EXTERNAL UNIT "POWER BOARD"

SUBCOM 2000 SYSTEM BELL EXTERNAL UNIT "MODULATOR BOARD"

SUBCOM 2000 SYSTEM BELL EXTERNAL UNIT "MODULATOR BOARD"

SUBCOM 2000 SYSTEM BELL EXTERNAL UNIT "MOTHERBOARD"

SUBCOM 2000 BELL EXTERNAL UNIT "MOTHERBOARD"

SUBCOM 2000 SYSTEM BELL BATTERY PACK "ASSEMBLY"

SUBCOM 2000 SYSTEM BELL BATTERY PACK "CIRCUIT DIAGRAM"

SUBCOM 2000 BATTERY CHARGER CIRCUIT

MODEL NUMBER: 3242-3001

SUBCOM 2000 BATTERY CHARGER PCB COMPONENT LAYOUT

END OF DOCUMENT