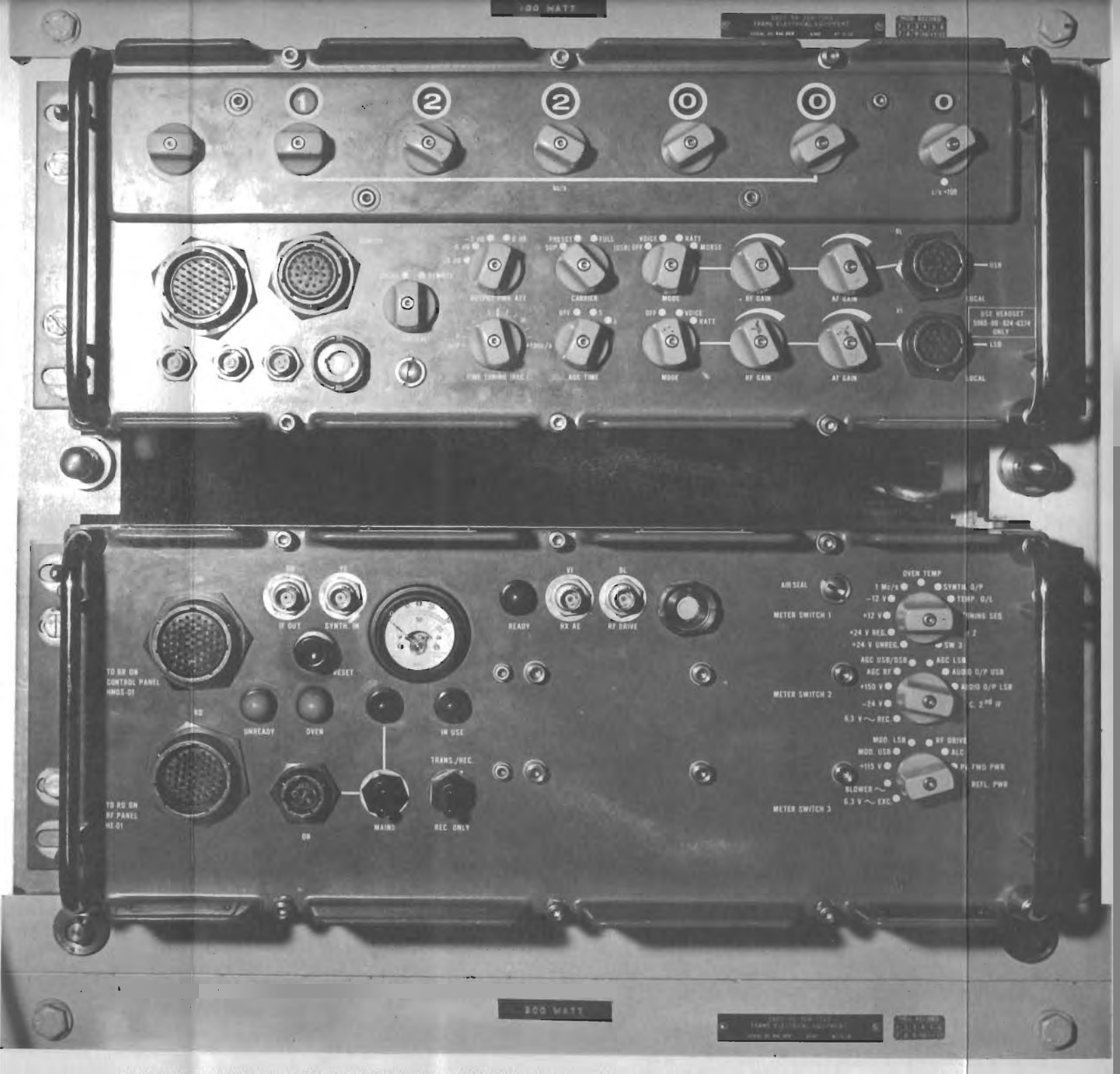
THE SUBMARINE SSA SYSTEM

{If that meant Submarine System A, how would they have denoted Submarine System B ? Not with SSB, obviously !}

You will have read that when SSB was introduced into the Surface Fleet, it came as a package called COMIST [Communications Improvement in the Short Term] and involved the fitting of the transmitter type 640 and the receiver CJK in lieu of the transmitter 601 Series and the receivers CDW/CDY [B40D/B41]. Later, an improvement for the long term was made by the introduction of ICS [Integrated Communications System]. However, before COMIST, surface ships were already well established with RATT, receiving it with the B40D and the CV89A and transmitting it with the 601 series using either a 5AB/GK185A FSK keyer, or a 5AB/A keyer built into the modified 5AB.

Submarines, unlike surface units, had remained wholly CW, both transmission and reception. When it came the time for them to be improved, and also incidentally in the SHORT TERM, the navy selected a Dutch system called Van Der Heem to replace the transmitters 623/619 [or TCS] and the old receiver. They called it the SSA System, which was primarily a transceiver [they called the transmitter section an exciter] with a common synthesiser [fed by its own internal 1MHz frequency Standard], an amplifier [choice of two], an aerial system working simplex, and a small control system – the pictures of its constituent parts follow below.
It was capable of CW and MCW, RATT [A2RATT and FST {F1}] and VOICE [SSB and DSB {A3H}].

Later, the outfit SSA was replaced by ICS, but with a reduced surface ship fit, and this represented a submarines improvement for the LONG term.


100 WATT
MODE
RF GAIN
AF GAIN
USB
LSB
LOCAL
CARRIER
ACC TIME
IF OUT
SYNTH. IN
READY
RX AE
RF DRIVE
RESET
UNREADY
OVEN
IN USE
TRANS./REC.
MAINS
REC ONLY
AIR SEAL
OVEN TEMP
METER SWITCH 1
METER SWITCH 2
METER SWITCH 3
BLOWER
300 WATT

TRANSRECEIVER TYPE SSA—
TRANSMITTER MF HF AERIAL EXCHANGE

TRANSRECEIVER TYPE SSA—
HF RECEIVER AERIAL EXCHANGE

OUTFIT SSA 500 WATT TRANSMISSION AMPLIFIER

SUMMARY OF DATA

PURPOSE

The Synthesizer, Exciter, is a source of stable signals provided at a controlled output power level; the output is used to drive a Transmission Amplifier. The Receiver, together with the Synthesizer, allows signals to be detected or demodulated. Transmission and reception cannot be carried out simultaneously; the Synthesizer provides either a carrier frequency (transmission) or a local-oscillator frequency (reception) which can be selected in discrete steps of 100 Hz.

BRIEF DESCRIPTION

The Synthesizer generates frequencies, derived from a stable frequency source, in the range 1.5 to 29.9999 MHz for transmission purposes; it also generates frequencies in the ranges 200 to 560 kHz and 1.5 to 30 MHz for reception. The Synthesizer signal to the Exciter is muted during receive condition; during transmit conditions, the Synthesizer signal to the Receiver is muted. Tuning of the Exciter and Receiver is carried out automatically and in conjunction with the associated Transmission Amplifier and Antenna Tuning Unit. Tuning is controlled by the 8300 Control Panel.

The output power from the associated Transmission Amplifier is maintained at a sensibly constant level by automatic level control (alc) stages which adjust the rf output from the exciter in relation to the transmitter power output level.

The 8300 Control Panel contains, in the main, the synthesizer, modulators, if. amplifiers, demodulators and rf amplifiers. The 8400 Power Panel contains power supplies, the automatic tuning control stages, receiver rf and mixer stages, and exciter wideband amplifier stages.

TYPES OF TRANSMISSION

Upper-sideband (usb) with suppressed, preset or full carrier, modulated by morse, RATT or voice.

Lower sideband (lsb) with suppressed, preset or full carrier, modulated by RATT or voice.

Independent-sideband (isb) separate upper and lower-sideband information channels with the characteristics, respectively, of those above.

Upper-sideband (usb) with full carrier modulated by morse, RATT or voice.

TYPES OF RECEPTION

Upper-sideband (usb) with suppressed or preset carried modulated by morse, RATT or voice.

Lower-sideband (lsb) with suppressed or preset carrier modulated by RATT or voice.

Independent-sideband (isb) separate upper and lower sideband information channels with the characteristics, respectively, of those above.

Double-sideband (dsb) with full carrier modulated by morse, RATT or voice.

Upper-sideband (usb) with full carrier modulated by morse, RATT or voice.

FREQUENCY RANGE

Transmission : 1.5 to 30 MHz

Reception : 1.5 to 30 MHz and 200 to 560 kHz.

MAJOR UNITS AND PHYSICAL DATA

The Synthesizer, Exciter and Receiver consists of two units which together form one functional entity (HMOS); the two main units are:—

	Height	Width	Depth	Weight
5820-17-024-9260 8300 Control Panel	18 cm (7.375 in.)	44 cm (17.375 in.)	45 cm (17.75 in.)	37.2 Kg (82 lb)
5820-17-024-9261 8400 Power Panel	18 cm (7.125 in.)	44 cm (17.375 in.)	45 cm (17.75 in.)	48.1 Kg (106 lb)

ELECTRICAL CHARACTERISTICS – TRANSMISSION

Output Power	100 mW PEP (min) into a nominal 50-ohm load, measured with two tones of equal amplitude.
Output Power Control	Manual; reduces power output of associated 100 W Transmission amplifier, from full PEP, in three steps of 3 dB ± 0.5 dB.
Carrier Suppression	40 dB (min) below rated PEP output.
Opposite Sideband Suppression	45 dB (min) below rated PEP output.
Bandwidths	Voice: 300 to 3400 Hz ± 3 dB. Morse or RATT: 180-220 Hz ± 1.5 dB.
AF Input Levels	Selected by Local-Remote switch. Local microphone inputs (usb and lsb): 100-ohm; 20 to 40 mA, 60 mV +12 dB or −6 dB. Remote line inputs (usb and lsb); 100-ohm, 20 to 40 mA, 60 mV +12 dB or −6 dB.

ELECTRICAL CHARACTERISTICS – RECEPTION

Noise Factor	200 to 560 kHz, 12 dB 1.5 to 15 MHz, 12 dB 15 to 30 MHz, 15 dB
Sensitivity	For ssb operation with a cw signal tuned 1 kHz away from carrier, an aerial emf of not greater than 1 μV gives 3 mW into a 600-ohm load when the MANUAL RF GAIN control is set at maximum.
Manual RF Gain	Manual rf gain control allows a variation in overall gain of the rf and if amplifiers of at least 100 dB.
Selectivity	Filter Bandwidth for A3 Mode: Minimum 6 kHz ± 3 dB pass-band relative to mean response. Selectivity 12.6 kHz at −60 dB relative to mean response. Filter Bandwidth for A3J Mode: Minimum 300-3400 Hz ± 3 dB passband and 400-3150 Hz ± 1.5 dB relative to mean response. Selectivity 7.5 kHz maximum at −60 dB relative to average. Filter Bandwidth for A3B Mode: Two equal bands as in A3J Mode. Filter Bandwidth for A1 Mode: 180-220 Hz passband for 3 dB attenuation relative to centre frequency of 1000 Hz; maximum bandwidth of 100 Hz at 60 dB attenuation. Overall Performance: Not degraded by more than 1 dB at the end of the passband closest to carrier and 3 dB at the end furthest from carrier for the above quoted modes.
Maximum On-Tune Signal and Muting	The receiver is capable of withstanding, without damage, on-tune signals of up to 5 volts peak amplitude.
Automatic Gain Control	Less than 9 dB variation in output from input levels between 1 μV and 100 mV emf. Can be switched off. AGC time-constants (measured at audio output):

	Rise Time	Decay Time	
Long	30 ± 10 ms	5 sec	± 2 sec
Short	30 ± 10 ms	600 ms	± 300 ms

D.S.B. operation only:-

100 ± 30 ms 200 ± 60 ms

Blocking	An undesired signal, 15% off tune (150 kHz for MF ranges), at an amplitude of 100 millivolts does not degrade the wanted 1 μV signal by more than 3 dB.
Hum and Noise	With 20 mV emf aerial input, and with the equipment switched to the SSB mode, the output signal-to-hum/noise ratio is not less than 35 dB with the gain control set to give 10 mW, on remote output lines, into 600 ohms.
Audio Output (for 1 mV emf aerial input)	At remote usb and lsb outlets: 10 mW balanced into 600-ohm load. At local usb and lsb outlets (output impedance 100 ohms approx.) and with front panel af gain control at maximum: 1 mV ± 2 dB.

Total Audio Distortion	With a 100 mV aerial rf input signal, modulated by 400 Hz tone, and in ssb mode: does not exceed 2% for 10 mW output.
Noise Limiting	A noise limiter is included for dsb operation.
Receiver (Aerial) Input	To be fed from a 50-ohm unbalanced source.

POWER REQUIREMENTS

115 V ± 5%, 45 to 430 Hz, single-phase or
230 V ± 5%, 45 to 430 Hz, single-phase

HANDBOOK

BR 2488(5)(1) and (2)

ESTABLISHMENT LIST

S 1535

INSTALLATION SPECIFICATION

B 1028

100 W TRANSMISSION AMPLIFIER (SYSTEM SSA SERIES)

SUMMARY OF DATA

PURPOSE

To provide a 100 W PEP rf output which is suitable for emission via an Antenna Tuning Unit to an antenna. The amplifier is driven by a low level rf input from an associated exciter.

BRIEF DESCRIPTION

The 9800 RF Panel contains all the rf amplifying stages and the servo amplifying and tuning stages; the 9900 Power Panel contains all the required power supplies for the rf panel. Both units are fitted with a blower. The amplifier is automatically tuned by servo/discriminator systems which sense the frequency and phase of the low level rf input signal.

TYPE OF TRANSMISSION

SSB, CW/FSK, AM

FREQUENCY RANGE

1.5 to 30 MHz

MAJOR UNITS

The Transmission Amplifier consists of two units which together form one functional entity (HE).

5820-17-024-9262	9800 RF Panel
5820-17-024-9263	9900 Power Panel

PHYSICAL DATA

	Height	Width	Depth	Weight
9800 RF Panel	18 cm (7.125 in.)	44 cm (17.375 in.)	45 cm (17.75 in.)	35 Kg (77 lb)
9900 Power Panel	18 cm (7.125 in.)	44 cm (17.375 in.)	45 cm (17.75 in.)	35 Kg (77 lb)

ELECTRICAL CHARACTERISTICS

Output Impedance : 50 ohm (nominal)

Input Impedance : 50 ohm (nominal)

RF Input Level : Not greater than 100 W PEP for 100 W PEP into 50 ohm (nominal) load.

RF Power Output (50 ohm load)

SSB Mode : 100 W PEP measured with two tones of equal amplitude

CW/FSK Mode : 50 W (Mean)

AM Mode : 25 W (mean power) carrier

POWER REQUIREMENTS

115 V or 230 V ± 5%, 45 to 430 Hz, single phase.
Consumption 550 W maximum.

HANDBOOK

BR 2489

ESTABLISHMENT LIST

S 1535

INSTALLATION SPECIFICATION

B 1028

1 KW TRANSMISSION AMPLIFIER (SYSTEM SSA SERIES)

SUMMARY OF DATA

PURPOSE

The HF Transmission Amplifier is capable of a 1 kW PEP rf output, but this is restricted to a lower level when used with System SSA. The amplifier is driven by a low level rf input from an associated exciter.

BRIEF DESCRIPTION

The two major units are each housed in a separate cabinet constructed from cast aluminium alloy and fitted with telescopic slides upon which the units are mounted. The power supply cabinet also contains a blower unit, an external ALC unit; an rf relay and a 50 ohm dummy load. The transmission amplifier is cooled by the blower unit which draws in filtered air at ambient temperature through a grill below the power supply unit; the cooling air is expelled through an exhaust duct at the top rear of the assembly.

The amplifier is automatically tuned by a servo system which senses frequency and phase errors between the low level rf input and the levels existing across the main tuning elements; manual tuning facilities are also provided.

TYPE OF TRANSMISSION

CW

FREQUENCY RANGE

1.5 to 30 MHz

MAJOR UNITS

The Transmission Amplifier is housed in two cabinets which together form one functional entity (TA349E)

5820-99-520-0570 RF Amplifier
5820-99-520-0571 Power Supply Unit

PHYSICAL DATA

	Height	Width	Depth	Weight
RF Amplifier	40 cm (15.75 in.)	48 cm (19 in.)	56 cm (22 in.)	73 Kg (160 lb)
Cabinet	54 cm (21.125 in.)	60 cm (23.5 in.)	81 cm (31.85 in.)	46 Kg (101 lb)
Power Unit	32 cm (12.25 in.)	48 cm (19 in.)	62 cm (24.375 in.)	124 Kg (272 lb)
Cabinet with Blower	55 cm (21.375 in.)	60 cm (23.5 in.)	81 cm (31.875 in.)	53 Kg (137 lb)

ELECTRICAL CHARACTERISTICS

Output Impedance : 50 ohm (nominal) unbalanced
RF Power Output : Adjustable by ALC to either 800 W CW or 1 kW PEP
RF Input Level : 50 mW into 50 ohm (nominal) unbalanced
VSWR : 2 to 1 maximum

POWER REQUIREMENTS

115 V ± 5%, 47–65 Hz, single phase
Consumption 3.5 kVa

HANDBOOK

BR 2490

ESTABLISHMENT LIST

S 1535

INSTALLATION SPECIFICATION

B 1028

100W TRANSMISSION AMPLIFIER (SYSTEM SSA SERIES)

SUMMARY OF DATA

PURPOSE

To provide a 100W p.e.p. r.f. output which is suitable for emission via an antenna tuning unit to an antenna. The amplifier (fig. 1.1, B.R.2489(5)A) is driven by a low-level r.f. input from an associated exciter.

R.F. INPUT LEVEL

Not greater than 100W p.e.p. for 100W p.e.p. into 50-ohm (nominal) load.

FREQUENCY RANGE

1.5 to 30 MHz.

R.F. POWER OUTPUT (50-OHM LOAD)

S.S.B. mode : 100W p.e.p. measured with two tones of equal amplitude.

C.W./F.S.K. mode : 50W (mean)

A.M. mode : 25W (mean power) carrier.

OUTPUT IMPEDANCE

50-ohm (nominal)

INPUT IMPEDANCE

50-ohm (nominal)

PHYSICAL DATA

The Transmission Amplifier consists of two units which together form one functional entity (HE); the two main units are:-

(a) 9800 R.F. Panel 5820-17-024-9262

(b) 9900 Power Panel 5820-17-024-9263

The approximate dimensions and weight of the two units are as follows:

	Height		Width		Depth		Weight	
	in	cm	in	cm	in	cm	lb	kg
9800 R.F. Panel	7⅛	18	17⅜	44	17¾	45	77	35
9900 Power Panel	7⅛	18	17⅜	44	17¾	45	75	34.1

BRIEF DESCRIPTION

The 9800 R.F. Panel contains all the r.f. amplifying stages and the servo amplifying and tuning stages; the 9900 Power Panel contains all the required power supplies for the R.F. Panel. Both units are fitted with a blower. The amplifier is automatically tuned by servo/discriminator systems which sense the frequency and phase of the low-level r.f. input signal.

POWER REQUIREMENTS

115V or 230V ± 5%, 45 to 430 Hz, single-phase

Consumption 550W maximum.

HANDBOOK

B.R.2489

ESTABLISHMENT LIST

S.1535

INSTALLATION SPECIFICATION

B.1028.

THIS IS THE ORIGINAL AMPLIFIER OF THE 1970's PERIOD.

In the 1980's, a new amplifier was introduced which gave a choice of either 100W or 200W. At this point, the 100W RF Panel was known as the 9800 and the Power Panel as the 9900 and the 200W RF Panel became the 9802 with a 9902 Power Panel.