CODAN - Outback radio to global communications - Part 2

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1. Introduction to HF products marketed

The products marketed by Codan covered all aspects of HF communications. At one end they designed and constructed the plant necessary for broadcasting, including studio equipment, high power transmitters, antennas, remote control facilities, while at the other end simple transceiver equipment for small outpost stations. In this article only the RF products have been categorised. Studio and remote control equipment operating over wires and telephone lines have been omitted. The categories considered are transceivers, receivers, transmitters, antennas, antenna tuners, and mains power supplies. For each category brief comments will be made followed by a table of products.

2. Transceivers

A surprising range of transceivers were produced, emphasis always being placed on compactness and performance. Certainly in todays changing world many electronic products are considered out of date after two years. Consequently in recent years new transceivers models needed to be produced more frequently. With some equipment the specifications evolved during the design process. For example, the type 6801 set (Figure 1) when first envisaged was a three channel 15 watt PEP SSB transceiver, yet the final product was five channel and 100 watts. Popular types came out as series, later improved versions either a Mark 2 or with a letter added after the four digit type number to signify a change. Significant upgrades included the use of thick film daughter boards, separate control heads, eventually all essential controls truncated to fit on the back of the microphone, frequency synthesis, microprocessor/software control, double conversion receivers, and remote interrogation from another location to ascertain the condition of a set. At least two attempts were made to produce "homestead" style sets (types 7303 and X-2), that is, sets whose appearance fitted in with modern home styling, while the new generation transceivers (NGT) begin to appear a little like a "mobile" phone in styling. In the last decade the transceivers allow attachments, so that facsimile, data transmission, email and such can be sent over the HF link. Table 1 provides a listing of transceiver sets.

Figures 2 and 3 show the original portable 6104 set and circuit diagram while Figure 4 gives examples of three different set styling.

Type No.	Use"	Style**	Comments .
6104	P	A	First set. Valve type construction. SS receiver, 455kHz IF, 5 channels, ceramic filters. Two valve transmitter, 8 watts RF. AM only.
6104A	L		As above but 12 channels and in a larger case
6104B	A		Special light weight version of above for light aircraft
6104C	P		Single channel version of above
6104 Mk2	P	A	As 6104 except PCB receiver type 6415 used, 455kHz IF mechanical filter
6201	S		200kHz -18MHz receiver, transmitter 2-9MHz, marine AM set, 455kHz IF, 50 watts RF , Receiver DF loop
6319	M		1.6 - 10 MHz, 1 channel, AM set, 455 kHz IF, 25 watts RF.
6319A	M		As 6319. Minor modifications to the transmitter valve output stage.
6332	P	A	Battery pack. Whip aerial. Type 6415 single PCB SS receiver, 455kHz IF, mechanical filter. Two valve transmitter, 8 watts RF. AM only, 5 channels.

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6332A	P	A	As 6332 but 10 channels
6605*	B		Base station for EFS (CFS).
6619	P	A	1.6-10 MHz, AM set, 10 channel, 455kHz IF, mechanical filter, Valve output stage, 25 watts RF. B/C receiver built in.
6717	H		1.6 - 10 MHz, Single channel, AM, hand held, 455 kHz IF, mechanical filter, 1 watt RF, internal battery
6801	L	G	Fully solid state. 1650 kHz IF, Output impedance 50 ohm. SSB (normally USB) and AM (H3E). watts RF.
6801-P	B	G	As 6801 but made especially for PNG P & T
6801 Mk2	L, S	G	2-16 MHz. 10 channel. Fully solid state. Thick film modules used. 1650kHz IF. Output impedance 50 ohm. SSB (normally USB)and AM (H3E), 100 watts RF.
6801-S Mk2C	S	B	Marine version 6801 Mk2
6802	B	B	As above, 6801 Mk 2 receiver and exciter, modified transmitter output, 100watts PEP. RTTY and Fax operation
6803	B	B	As 6802 above, but with remote control facilities
6924	P	G	2-10MHz, 10 channel. Fully solid state. 1650kHz IF, 25 watts PEP, SSB (normally USB) and AM (H3E)
6924 Mk2	P	G	2-13MHz, 10 channel. Fully solid state. 1650 kHz IF, 30 watts PEP, SSB (normally USB) and AM (H3E), output impedance 50 ohms (as well as in built antenna tuner)
6924B	P	B	Same as 6924 Mk2 but new styling
6924C	P	G	2-13 MHz, 25 watts PEP, 10 channel, ruggedised waterproof transceiver
7005	B	G	10 channel, AM and SSB, similar to 6801 Mk 2
7007	B	G	3 channel, AM only transceiver, styling similar 6801
7303	B	G	2-11 MHz, 5 channel, Fully solid state, 1650 kHz IF, 50 watts PEP, SSB (normally USB, and AM (H3E), output impedance 50 ohms, push button operation
7307	B	P	Same as 7515, but in a special plastic case for "Homestead" use - School of the Air and RFDS. Emergency call fitted as standard.
7515	L	G	2-11 MHz, 6 channel initially then increased to 10, fully solid state, 1650kHz IF, 50watts PEP, SSB (normally USB and AM (H3E), output impedance 50 ohms
7727	L	G	Same as 7515 but increased RF power - 100 watts PEP
7727-C	L	G	As 7727 above but cosmetically upgraded. Also available with remote control box and speaker
7727-T	L	G	As 7727 but with remote control
7727-TB	L	B	As above, but cosmetically different again having a digital channel display. Remote control box and separate speaker.
7924-B	P	G	2-13 MHz, 10 channels, solid state, 1650 kHz IF, 25 watts PEP output, SSB (Normally USB) and AM (H3E), ruggedised, water proofed, carry bag, sealed internal battery.
7924-C	L	G	As 7924-B above. Option of a hand crank generator.
8121	S		2-13.2 MHz, 10 channels, 60W PEP, AM compatible only on 2182 kHz
8332	H	Y	1.6 - 6 MHz, 2 channel, 1watt PEP. Hand held set.
8525	L	B	2-18 MHz, 99 channels, 20 standard, dual conversion receiver (IFs 45MHz and 1650kHz), frequency synthesis, digital display,

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			SSB, 100 watts PEP
8525-B	L	S	2-24 MHz transmit, receive 250 kHz to 30 MHz, scanning up to 15 channels, SSB,125 watts PEP, up to 99 channels with 20 standard, 50 ohm impedance, touch membrane controls, available with separate control head type 8530
8525-S	S	S	A marine version above, 2-18 MHz transmit, receive 1.6 -18 MHz, SSB but AM (H3E) on 2182 kHz.
8528	L	S	2-24 MHz transmit, receiver 250 kHz - 30 MHz, up to 600 channels, receiver scanning up to 15 channels, SSB, transmit power variable 25 to125 watt PEP, 50 ohm impedance, touch controls back lit liquid crystal display, available also with separate control head type 8531
8528-S	S	S	As above but marine version. Can have separate control head type 8531S, PEP of 125, 200 or 400 watts
8528-I	L	S	International version of the 8528, having improvements in performance through new software. Identification plate carries a "K" prefix on the serial number.
8727	L	S	2-16 MHz, 10 channels, SSB, 125 watts PEP. Also available separate control head type 8730.
X-2 (Also 9105)	L	K	2-18 MHz, 10 programmable channels, LSB and USB, speech processing, audio tones indicate important operating conditions/faults, output variable 25 to 125 watts PEP, dual RF output to match whip of dipole antennas.
9313	L	S	Cut down version of the 8528 for the local market. Synthesised 15 channels, SSB, 100 watts PEP, 2-24MHz transmit, 0.25 - 30 MHz receive, control head type 9320, membrane switches, liquid crystal display
9323	L	B	As for type 9360 except transmitter 100watts PEP and on Australian 27 MHz CB band 10 watts PEP. Control head option is type 9330.
9360	L	S	Synthesised, 400 channels, 10Hz resolution, microprocessor control, SSB, 50 ohm impedance. Receiver 0.25 - 30 MHz, 45MHz and 455 kHz IFs. Transmitter 2-26.5 MHz, 125watts PEP, CW or single tone approx 60% PEP. Control front panel or microphone keypad. Available with control head type 9366. In-built remote diagnostic facility.
9390	S	S	Marine version of the 9360. With Type 4404 power amplifier increase PEP to 400 watts (Type 9390-H). Control head available type 9391.
9480	L	S	Cut down version of 8528 for international market. Synthesised 15 channels with voice scanning, SSB, 2-24 MHz transmit, 100 watts PEP, optional control head type 9482, comprehensive LCD display, new automatic emergency digital calling
9780	L	S	As for type 9360. Supports non voice applications.
HF1000	A	B	2-14MHz, SSB, 10 channels, 1650 kHz IF, 100W PEP, aviation transceiver, control head panel or rack mounting, digital channel readout
HF2000	A	B	2-16MHz, SSB with AM (H3E) option, 28 channels, 1650 kHz, 100W PEP, aviation transceiver, control head panel or rack mounting, digital channel readout

HF4000	M	B	2-23MHz, 256 channels, marine transceiver, SSB with AM (H3E) on 2182 kHz, digital frequency readout, 150, 200 and 400 watt PEP
2010 (NGT xx)	L		1.6-30 MHz, 125 watts PEP, SSB and AM (H3E) up to 400 channels, operated from a remote desk console, supports non voice operations, receiver will tune down to 250 kHz. As a mobile unit needs junction box type 2030 Note; If the xx letters are - AR = Australia (100 watts), SR = System Radio, VR = Voice Radio (15 channels).
NGT	R		2-30 MHz, 500 or 1000 watts PEP, NGT SR remote control, SSB, AM, external control, up to 400 channels

Table 1 Codan transceiver set types and a brief description of them

3. Receivers

Separate receivers are often needed for remote control operations or separating the receiver from the transmitter site when the latter is in an electrically noisy environment. While specific contracts have called for such receivers only one general purpose receiver the type 7004 was sold in quantity. It is a single frequency type, and one signal mode (LSB, USB or AM) both specified when ordering. Matching aerial couplers and power supplies are also available so that banks of receivers can operate together from common aerials and supplies. Table 2 provides details on receivers while Figure 5 shows the 7004 receiver.

Type No.	Style"	Comments .
601-		Single frequency crystal locked AM receiver for remote locations with audio output and power to receiver transmitted down one pair of lines. A IF 10.7 MHz using a lattice crystal filter. Rack mounted module
602-		Single frequency crystal locked AM receiver for remote locations, audio out and power to receiver transmitted down one pair of lines. A conventional 455kHz IF. Rack mounted module
6415	PCB	Single PCB AM receiver, 455 kHz IF, mechanical filter.
6604*		DSB, AM two channel
6608		Remote receiver, based on type 6415 receiver, internal line transformer, supply 12v DC - positive ground
6702*		22.2 MHz receiver for WRE (DSTO)
6707		2 channel receiver based on the PCB receiver from type 6619 transceiver
6718*		27 MHz receiver for Adelaide University
6809*		Single channel receiver board
6907*		SSB remote receiver
7004	G	2-30 MHz, SSB or SSB and AM, 1650 kHz IF. Table top or rack mounting (code 151) 7905 matching multicoupler (up to 6 receivers) 7207A matching power supply (up to 7 receivers)

Table 2 Codan receiver types and a brief description of them

4. Transmitters

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Transmitter of higher power were originally required for two areas. Firstly marine operation and the 4400 series was designed to satisfy this need, allowing either 200 or 400 watts. Secondly, base stations for the RFDS and similar operations required rack mounted transmitters of 500 and 1000 watts power (7010 series). The NGT is the most recent addition to the series allowing control of up to 400 channels. Table 2 lists these transmitters and provides brief details. Figure 6 shows a type 7010 series transmitter with exciter.

Type No.	Style"	Comments .
6307*		AM transmitter, 300 watts
6915*		25watt RF power amplifier
4402	B	2 - 23 MHz, 200 watt power amplifier, 24v DC in
4404	B	2 - 23 MHz, 400 watt power amplifier, 24v DC in
7010 series	R	2 - 12 MHz, 500 or 1000 watts PEP, SSB, AM (A3H), external control up to 6 channels. Rack mounted 7021 linear exciter, 7010 is linear amplifier
NGT	R	2-30 MHz, 500 or 1000 watts PEP, SSB, AM, external control, up to 400 channels. Rack mounted.

Table 3 Codan transmitter types and a brief description of them

5. Antennas

The first transceivers sold were portable with build in antenna units. For most other operation (base, mobile or marine) a transceiver with 50 ohms impedance was designed so that antennas having a 50 ohm impedance at the frequency of operation are needed. Codan provides a range of such antennas, ranging from tower supported dipoles to automatic tuning whip antennas. Codan has a close working relationship with Peter Leonard of Lencom Antennas Pty Ltd. Table 4 list the antennas available.

Type No.	Use**	Comments .
300 series	M	2 - 16 MHz, multi frequency operation tapered helical whip, 1.8 metres long
311 series	M	2-16 MHz, automatic selection of preset frequencies, 50 ohms impedance, 120 watt rating, < 2.5 metres long, requires 12v DC
400-1	B	2 - 30 MHz, single frequency wire dipole antenna, 50 ohms impedance, rated 150 watts
402 series	B	2-10 or 2.5-16 MHz broadband wire antennas for multi frequency operation, 50 ohms impedance
403	L	2-16 MHz, long wire antenna approx 30 metres in length
406	B	2-15MHz, 9.5 metres vertical antenna, rated 150 watts. Self resonate at 7.5 MHz. Needs an antenna tuner (7208 or 7403)
407 series	B	2.2-15 or 3-20 MHz, broadband dipole, rated 1000 watts
408 series	B	As 407 but 100 watts rating
409 series	B	2-18 MHz, helical dipole for up to 3 frequencies of operation, rated to 100 watts. A restricted space antenna, of either 4.5 or 7.5 metres span.
420 series	B	Series of 3 sections telescopic guyed towers up to 22.5 metres height
8558	M	2-24 MHz, microprocessor controlled, multi channel automatic tuning whip antenna, 2.18 metres length, 50 ohms impedance, 12v DC required. Options are type 8551C antenna control unit

		and type 8552 tuner-controller.
9350	M	2-30 MHz, automatic tuning whip antenna, 125 watts rating

Table 4 Codan antenna types and a brief description of them

6. Antenna tuners

To ensure correct operation a transceiver must be matched to the antenna at 50 ohm impedance. To achieve this at several frequencies an antenna tuner may be required. Table 5 list those units available. Figure 7 show the 7208 Mk 2 manual antenna tuner.

Type No.	Use**	Comments .
4201	S	2-24 MHz, manual operation
4203	B, S	2-24 MHz, rated 400 watts, fully automatic
6309*		No information currently available
6826*		No information currently available
7101 Mk 2	B	Connects up to 6 antennas to a transceiver
7208 Mk2B	B	2-16 MHz, antenna tuner for long wire antenna, rated 120 watts
7403	L, S	2-16 MHz, fixed antenna tuner for whip or long wire, rated 120 watts
7411	L	
7411 Mk2B	S	Designed to operate with 6801 Mk2 marine transceivers
8551C/8552	M	See type 8558 antenna in Table 4. Type 8551C is an antenna control unit while 8552 a tuner controller
8560	S	2-24 MHz, rated to 400 watts, manual operation
9103	B	2-30 MHz, automatic antenna tuner for whip of end fed long wire antennas, 150 watts rating

Table 5 Codan antenna tuning units and a brief description of them

7. Mains power supplies

Codan sets are normally designed to operate from a 12 volt DC supply. The exception to this are the high power transmitters which require either 24 volts DC or mains supply. Where mains supply is available it is simpler to eliminate the need for a battery and use a mains maintenance free DC supply. Codan make a range of these to power their equipment and Table 6 lists them.

Type No.	Style"	Comments .
507	B	Heavy duty for 24v operation, 27.5V, 40A rating
7113	B	Bench and rack mountings (code 154), 13V, 12.5A rating
7113-B	B	As for 7113
7202-A	B	Power supply for 7004 receivers, 12v, 250mA rating
8540	S	As 7113 above except 13.8V, 12.5A rating
9113B	S	Bench mounting, 13.8V, 6A rating
9114	S	Bench mounting, 13.8V, 16A rating

Table 6 Codan mains power supply types

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Solar panel power supplies were also produced to charge the 12 volt batteries that powered sets, examples being the types 531 (single solar panel, 2.7 amps charge) and 532 (dual solar panel, 5.4 amps charge) with the 7805 series of solar panel regulators.

8. Concluding Remarks

The history of Codan is quite remarkable. Established by three recent graduates, tackling a wide range of engineering jobs for survival was a high risk venture. All three were entrepreneurs, people not frightened of hard work, men who had their feet firmly on the ground in the real world. Naturally there were elements of good fortune, particularly the timing of the change over of HF services from AM to SSB, and collectively all were factors which led to the growth of the company, and its eventual success no matter whether it be judged in terms of sales turnover, number of staff employed, established global network of agents, distributors and service centres or becoming Australia's largest supplier of commercial (non military, non amateur) HF equipment, satisfying the majority of Australian needs as well as significant overseas market segments. Such customers include international relief agencies, multinational corporations and government agencies. Credit must be given to Ian Wall and Alastair Wood, founding Directors who looked after all the engineering aspects, to Managing Director, Jim Bettison, as well as to those who followed him, namely Kingsley Hannaford and currently Mike Heard. After over 40 years of continuous operation Codan has grown to become a significant world leader in commercial HF radio equipment and technology.

9. Acknowledgments

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Notes for Tables 1 to 6 :-

* Extracted from original 1960 to 1969 products book

** Use - B = Fixed base use
H = Hand held
L = Land use both fixed and mobile
M = Mobile vehicle operation
P = Portable. Has in built antenna tuning unit
S = Marine use

" Style - A = Grey with military style knobs
B = Black painted with white lettering and black knobs
G = Green painted (light front panel and dark case) and tear drop knobs. Some of the later sets were painted a very dark blue
K = Polycarbonate case, khaki grey front panel, blue top cover
PCB = Printed circuit card
R = Rack mounted
S = Case silver-grey with black or blue panel
P = Plastic case with push button switches and tear drop knobs
Y = Yellow polycarbonate case/Black panel with white lettering

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Figures and captions for Part 2

Figure 1 Type 6801 SSB set, 5 channels, 100 watts PEP

Figure 2 Original type 6104 AM set. Note the two tin whistles to be blown to initiate an emergency call

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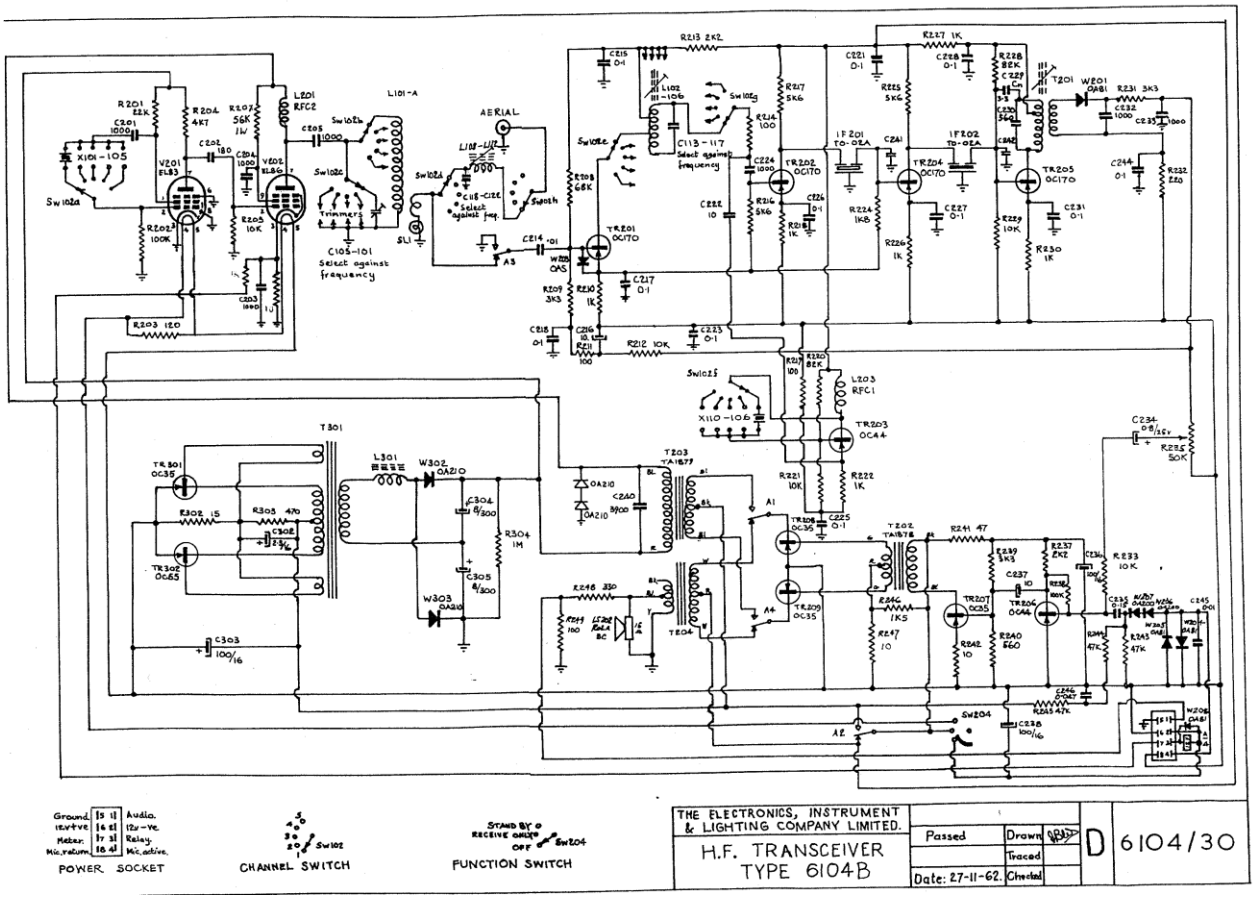

Figure 3 Circuit schematic diagram for the type 6104B

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Figure 4 - Four different sets illustrating styling.
a) Type 7727-TB (with control head),
b) The new style synthesised set, type 8528 with control head,
c) The X2 or 9105 plastic case set,
d) New Generation Transceiver (mobile version) type 2010

Figure 5 - Type 7004 receiver

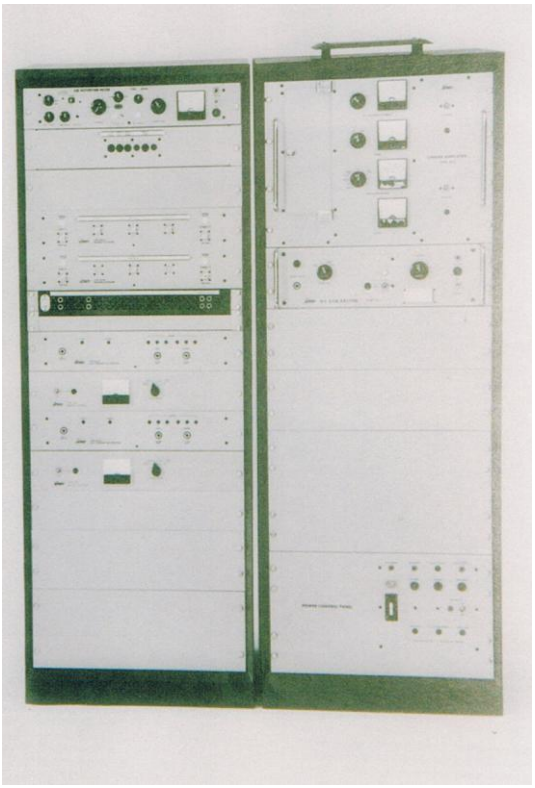

Figure 6 - High power type 7010 series transmitter (with exciter)

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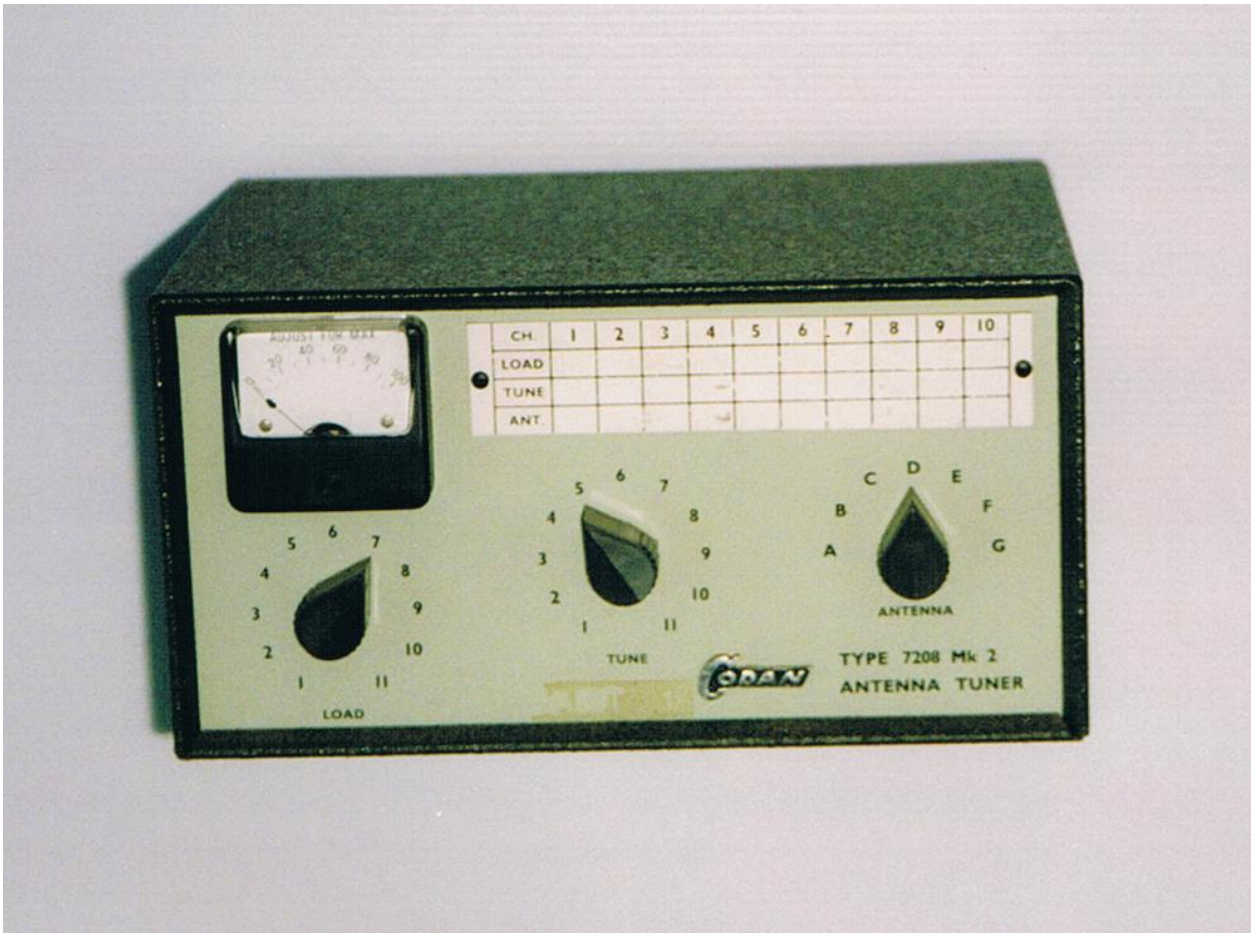

Figure 7- Manual antenna tuner, type 7208 Mk 2