

2.25. TYPE TCS

DATE OF DESIGN. 1941

HANDBOOK. U.S.N.

ESTABLISHMENT LIST. AE2

FREQUENCY RANGE. 1.5 to 12 Mc/s

FREQUENCY DETERMINATION. V.F.O. or Crystal Oscillator

EMISSION AND POWER OUTPUT. C.W. 40 W
Voice 20 W

1. **General.** Type TCS is an American transmitter and receiver outfit fitted as a low power transmitter and/or emergency outfit in some ships and as the main HF transmitter in some small craft. It is being replaced by Types 618 and 619. The receiver is not widely fitted and on account of its radiating properties should not be used during periods of wireless silence. The transmitter only is described here.

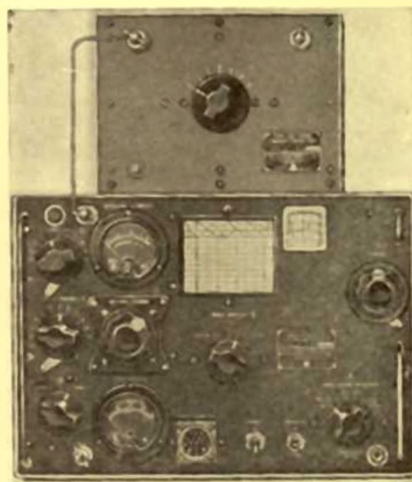


FIG. 1

2. **Power Supplies.** There are basically three separate power supply units available, only one of which is provided with each transmitter.

A.C. POWER PACKS. A rectifier unit which operates from 115 or 230 V a.c. or from 115 V a.c. only, two designs being available.

BATTERY POWER PACKS. A dynamotor unit which operates from a 12 or 24 V Battery outfit or from 12 V only, two designs being available.

UNIVERSAL POWER PACK. A motor generator unit. The motor generators are interchangeable and may be supplied to operate from any of the following supplies:

- | | |
|---------------|---------------|
| a. 24 V d.c. | d. 230 V d.c. |
| b. 32 V. d.c. | e. 115 V a.c. |
| c. 115 V d.c. | |

3. Frequency Build-up.

RANGE	V.F.O. (M.O.) OR CRYSTAL OSCILLATOR	DOUBLER TUNED CIRCUIT (BUFFER GRID)	BUFFER (DOUBLER) AMPLIFIER	POWER AMPLIFIER
1 1.5 to 3 Mc/s	1.5 to 3 Mc/s	Out	1.5 to 3 Mc/s	1.5 to 3 Mc/s
2 3 to 6 Mc/s	1.5 to 3 Mc/s	Out	3 to 6 Mc/s	3 to 6 Mc/s
3 6 to 12 Mc/s	1.5 to 3 Mc/s	3 to 6 Mc/s	6 to 12 Mc/s	6 to 12 Mc/s

4. **Crystal Frequency.** When using crystal oscillator control the frequency of the crystal will be:

$$\text{Range 1} = \text{Output Frequency} \quad \text{Range 2} = \frac{\text{Output Frequency}}{2} \quad \text{Range 3} = \frac{\text{Output Frequency}}{4}$$

5. **V.F.O. and Crystal Oscillator.** The transmitter may be v.f.o. or crystal controlled depending on the position of the Oscillator Selector Switch. In the M.O. positions a v.f.o. stage is employed which tunes between 1.5 and 3 Mc/s. The variable capacitor tuning is ganged to the TUNING control. In the COI, 2, 3 and 4 positions of the Oscillator Selector Switch a separate crystal oscillator stage is employed. The 4 positions allow for selection of any one of four crystals to be connected to the grid of the crystal oscillator valve. The output of the v.f.o. or crystal oscillator is fed to the Buffer Amplifier stage.

6. **Doubler Tuned Circuit.** This is a tuned circuit to the Buffer stage which is brought in by the range switch on range 3 only. It is tuned to twice the frequency of the v.f.o. or crystal oscillator stage by a variable capacitor which is ganged to the TUNING control.

7. **Buffer Amplifier.** The Buffer Amplifier, whose tuned circuit consists of one of three inductances selected by the range switch and a variable capacitor ganged to the TUNING control, acts as a straight amplifier on range 1. On range 2 it is tuned to twice the frequency of the v.f.o. or crystal oscillator. On range 3 it is tuned to twice the frequency of the Doubler tuned circuit, i.e. four times the frequency of the v.f.o. or crystal oscillator. Its output is fed to the grid of the P.A. stage.

8. **Power Amplifiers.** The P.A. stage employs two valves in parallel for c.w. working, whilst only one of these valves is employed on voice. The tuned circuit consists of a tapped inductance and fixed capacitors both of which are selected by the range switch and a variable capacitor for fine tuning controlled by the PLATE TUNING control. The P.A. stage is inductively coupled to the aerial by means of the variable coupling control. For voice transmission the anode and screens of the P.A. stage are modulated.

9. **Aerial Circuit.** A series-parallel arrangement whereby a fixed capacitor may be connected in series or in parallel with a variable inductance (Antenna Loading) or in the OFF position the inductance may be used alone. To allow better matching on the lower frequencies, an additional antenna loading coil fitted external to the transmitter can be used in series with the aerial, and provides an additional inductance with six tapping positions (marked 0 to 5) selected by the Antenna Loading Coil Switch. Position 6 of this switch shorts the coil out for use on the higher frequencies.

10. **Modulator.** A single push-pull modulator stage is employed for voice transmission. The microphone output is connected to the grids of the modulator via the input transformer and the output of the modulator used to modulate the H.T. and screen supply to the P.A. stage.

11. Controls

A - **OSCILLATOR SELECTOR.** Enables the use of four crystals or M.O. Also has a M.O. Test position. In this position H.T. is applied, without keying, to the oscillator and buffer stages only and enables the transmitter to be tuned to the dead space of the receiver frequency.

B - **BAND SWITCH.** Selects the appropriate tuned circuits in the Buffer amp and P.A. stages and on band 3 brings in the Doubler tuned circuit.

C - **TUNING.** Tunes the ganged variable capacitors in the M.O. Buffer amp. and Doubler tuned circuits.

D - **COUPLING.** Adjusts the coupling of the P.A. stage to the aerial circuit.

E - **PLATE TUNING.** Adjusts variable capacitor in the P.A. output circuit.

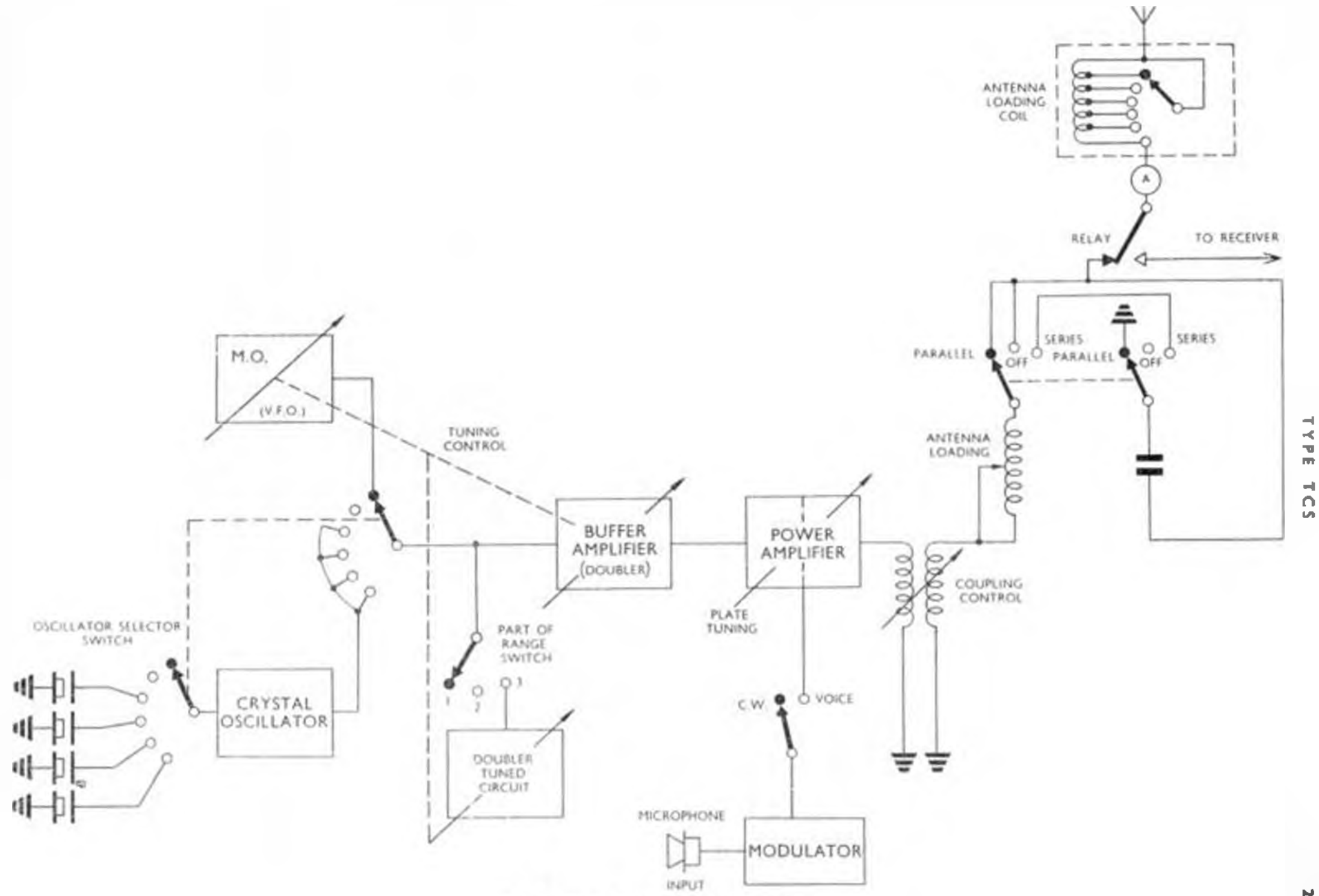


FIG. 2. TYPE TCS TRANSMITTER

TYPE TCS

F – ANTENNA CONDENSER. A fixed capacitor which can be switched either:

- a. Out of the circuit.
- b. In series, or
- c. In parallel with aerial inductance.

G – ANTENNA LOADING. Adjusts variable inductance in the aerial circuit.

H – AERIAL CURRENT AND P.A. ANODE CURRENT METERS. Standard loading marks are painted on the P.A. meter for voice and c.w. The aerial ammeter reads a maximum aerial current of 3 amps.

I – EMISSION SWITCH.

- a. *On c.w.* it brings in both P.A. valves in parallel and breaks the filament supply to the modulators.
- b. *On Voice* it breaks the filament supply to the second valve in the P.A. and makes the filament supply to the modulators (30 seconds should be allowed for the modulator filament to heat up).

J – ANTENNA LOADING COIL. An external tapped coil in series with the aerial circuit used for matching the aerial on Range 1.

12. V.F.O. Operation

- a. Set the following controls to starting positions as below:

Oscillator Selector Switch to M.O. (see note below).

Band switch to the appropriate band.

Tuning control to the appropriate frequency.

Plate tuning to 1.

Coupling to 0.

Antenna loading to 0.

Antenna Condenser switch to OFF.

Antenna Loading coil switch to 6.

Switch to c.w.

- b. Make power switch and wait about one minute.

- c. Check the setting of the Tuning Control against frequency standard being used (see note below).

- d. Adjust the Plate Tuning control for minimum in the Plate current meter.

- e. Increase the coupling slightly, and carry out standard aerial tuning drill using coupling, plate tuning, and antenna loading. Positions SERIES and PARALLEL of the Antenna Condenser switch should be tried if no correct tuning is achieved.

13. Crystal Operation

- a. Insert appropriate crystals.

- b. Set the oscillator selector switch to the crystal position required and remaining controls as for a of para. 12.

- c. Make power switch and wait about one minute.

- d. Adjust the tuning control for just off MAXIMUM in the Plate current meter.

- e. Carry out d and e of para. 12.

Notes. It is possible to set the transmitter to a frequency already set up on the receiver as follows:

(1) Set the Oscillator Selector switch to M.O. Test. (2) Adjust tuning control for dead space in receiver phones. (3) Carry out d and e as for v.f.o. operation.