Medium frequency transmitting unit
type A 217.V

Frequencies:

410, 425, 448, 454, 468, 480, 500, 512 kc/s preset.

Output power:

100 watts A1, about 120 watts A2, to the aerial circuit. Power measured in an external aerial (losses in aerial tuning device deducted) 40-60 watts depending on the capacity of the aerial.

Provision for reducing aerial power to one tenth.

Modulation:

When transmitting A2 the modulation depth is adjusted to about 90%, giving a very good signal to noise ratio at the receiving station.

Frequency tolerance:

The transmitter is not crystal controlled but incorporates a high stability temperature compensated master oscillator with maximum tolerance of about 0,05%, all errors taken into account.

Thus the transmitter fulfils the Atlantic City Conference frequency tolerance requirements of main transmitters, the said tolerance being 0,1%.

Harmonics:

All harmonics radiated from the aerial will be attenuated at least 40 dbs in relation to the fundamental (as required by the A.C. Conference.)

Aerial:

The transmitter may in the whole range 410-512 kc/s be tuned to an aerial with a capacity between 300 and 750 pF and a resistance of 2 to 5 ohms. At 500 kc/s the transmitter will even tune to an aerial with a capacity of only 200 pF

Artificial aerial:

The transmitter has an artificial aerial with a capacity of about 500 pF and a resistance of 3 ohms built in. A switch selects the artificial or the outdoor aerial. When power is led to the artificial aerial a red warning lamp on the front plate of the transmitter lights up.

Measuring instruments:

The transmitter is provided with a milliammeter and a switch by means of which the cathode current of each individual tube may be checked. Likewise the grid current of the R.F. amplifying tubes may be checked.

A thermocouple ammeter in the aerial circuit measures the aerial current.

Tubes:

6 tubes type 807 (or equivalent: Philips QE 06/50) are employed.

When mains operated a transformer supplies 25 volts A.C. for filament supply (all tubes) and a rectifier 24 volts D.C. for relays and microphone, another rectifier supplies 550 volts D.C. for anode supply.

When battery operated the filaments are supplied with 24 volts direct from the battery, anode voltage 550 volts being supplied by a converter working off the battery.

The current drain from mains or battery amounts to (transmitter keyed in position A3):

At 220 volts: about 2,8 amps.
At 24 volts: about 30 amps .

Facilities for change-over between mains and battery operation is normally not included but may be furnished on special request at an extra cost.

Keying:

A built-in keying relay operated either by the telegraph key or via an auxiliary relay by the push button of the microphone handset controls change over from "receive" to "transmit", when working telegraphy and telephony simplex.

Besides operating the keying relay the auxiliary relay mutes the receiver loud speaker (without affecting the earpiece output) and inserts a resistance load instead of the loud speaker.

When working "telephony duplex" the transmitter is keyed constantly by the control switch, but the push button of the handset has to be pressed for modulating the transmitter (the loud speaker consequently is muted during modulation).

Besides the said muting a voltage (normally 24 volts) is supplied for a muting relay in the receiver belonging to the radio station as soon as the key is pressed or, when working "telephony simplex", the handset press button is pressed (such relay normally shorts input and output terminals of receiver).

Dimensions:

Including switching panel (for either mains or battery operation - no change over) and if ordered switching and charging panel for both mains and battery operation (with change over):

Height: 1375 mm + aerial lead in 50 mm + shock absorbers 40 mm
Width: 550 mm
Depth: 400 mm + knobs + shock absorbers 40 mm
Weight: 150 kgs.

A 217 V - Operation.

Set transmitter selector switch in switching panel to "MF", set power switch to "1/1", set frequency switch in MF-transmitter to the frequency in question, set "Coupling" to "1", "aerial" switch to "outdoor" and "aerial coarse" to "1"; turn operating switch in switchboard to "stand by" for heating of tube filaments. After 15 seconds turn lever to A1 and press key. Rotate tuning knob "aerial fine" until aerial ammeter shows maximum aerial current. Cathode current of each of the tubes 3a, 3b, 3c and 3d then should amount to 100-120 milliamps. (no more than 125 milliamps.) If no resonance is obtained on "aerial coarse 1" switch to "aerial coarse 2" and repeat tuning procedure.

If cathode current of each of the no. 3 tubes is as low as 70-80 milliamps. with aerial tuned to resonance, switch to "coupling 2" and repeat aerial tuning.

If A2 operation is wanted then set operating switch in switchboard to A2 - and transmit.

During installation of transmitter, coupling capacitors should, according to directions given below, be adjusted so, that each of the no. 3 valves will draw a cathode current of 100-120 milliamps. in fair (dry) weather with "coupling" set to "1".

When aerial insulators and aerial lead-through get wet during rain or gale (salt water spray) the effective aerial resistance will increase and the aerial current decrease substantially. Due to coupling mismatch, loading of the power amplifier will further decrease and the cathode current of tubes no. 3 will decrease as much as to perhaps 60-70 milliamps. Under these circumstances load matching can be recovered by changing to "coupling 2". Cathode current of the no. 3 tubes then will assume their normal value and aerial current increase, although the "fair weather value" of aerial current will not be obtained.

If the outdoor aerial has a resistance different from the built-in artificial aerial ("dummy aerial", the resistance of which is normally adjusted to 3 ohms from the factory) the cathode current of the no. 3 tubes and the aerial current will not have the same value when transmitting on the artificial aerial as on the outdoor aerial.

Yet the outdoor aerial is decisive as to the values of coupling and compensating capacitors.

If wanted resetting the resistance value of the resistor of the artificial aerial might make conditions of "dummy" and "outdoor" transmitting equal.

Adjustment of coupling capacitors:

If in fair weather each of the no. 3 tubes draws a cathode current different from 100-120 milliamps. with the outdoor aerial correctly tuned and "coupling" set to "1" the value of capacity must be changed. If the tubes draw too high a cathode current the value of coupling capacity must be increased, if the tubes draw too small a cathode current the capacity must be reduced.

The coupling capacity consists of two mica capacitors CK 1 (about 20000 pF), permanently cut in, and CK 2 (about 10000 pF) which by means of a switch "coupling" may be connected in parallel with CK 1, giving a total coupling capacity of 30000 pF (coupling 1). Both capacitors may easily be replaced by others, as they are equipped with plugs which fit into corresponding sockets.

As the total capacity of the tank circuit of the power amplifier should remain constant when switching from "coupling 1" to "coupling 2" two compensating capacitors have been inserted in the circuit, one CU 1 (about 10000 pF), permanently cut in, and CU 2 (about 2000 pF) which is cut in when CK 2 is cut out and vice versa. The compensating capacitors likewise are equipped with plugs for easy replacement.

If it has been decided to change the coupling capacity, replace CK 1 by another capacitor which according to the above mentioned lines is likely to give the correct coupling and replace CK 2 by a capacitor about half the value of CK 1. Disconnect the outdoor aerial (switch "dummy/outdoor aerial" should be set to "outdoor"), press the key and notice the cathode current of the no. 3 tubes. If each tube draws a cathode current exceeding 60 milliamps. the compensating capacitor CU 1 has to be changed in the opposite direction of the coupling capacitors until tubes no.3 draws about 50-55 milliamps. each.

Next the aerial is connected up again, tuned to resonance, and the cathode current of the no. 3 tubes checked. Does each tube draw 100-120 milliamps. the value of CK 1 plus CK 2 has been correctly chosen. Is the cathode current not yet correct the procedure has to be repeated.

When the transmitter has been correctly matched to the aerial (in fair weather condition) according to the above mentioned procedure with "coupling" set to "1", disconnect aerial and set "coupling" to "2", press the key and notice the cathode current of tubes no. 3. Is the current higher than 60 milliamps. compensating capacitor CU 2 has to be changed until cathode current of each of the no. 3 valves is depressed to about 55 milliamps.

Then the aerial may be connected up again. A short touch of the key will now show a cathode current of more than 150 milliamps. with-out appreciable increase in aerial current. As such cathode current quickly will damage the tubes never use "coupling 2" except in bad weather when the cathode current with "coupling" set to "1" has fallen appreciately below normal. Switching to "coupling 2" in this case will bring the cathode current up to normal.

A 217V - Diagram.

The transmitter comprises a master oscillator, a buffer stage and a power amplifier. The master oscillator tube is an 807 tetrode working in a Colpitts circuit with fixed capacitors (silvered mica and ceramic capacitors, the latter with negative temperature coefficient for compensation) and 8 separate coils with adjustable powdered iron core for the frequencies 410, 425, 448, 454, 468, 480, 500, 512 kc/s. Each of the 8 coils is housed in its own individual shielding case for maximum stability. The master oscillator operates with much reduced anode and screen grid voltages for reducing heating of electrodes and consequently reduction of frequency drift.

The buffer stage also contains an 807 tube, the anode circuit of which is aperiodic and via a blocking capacitor directly connected to the grids of the power amplifier.

The power amplifier contains 4 parallel connected (with parasitic oscillation suppressors in grids and anodes) 807 tetrodes. The anode circuit of the P.A. consists of an anode-cathode capacitor, a coil with suitable taps and a coupling capacitor, the tuning elements being connected up as a pi-circuit. The exact tuning of the tank circuit takes place (at the factory) by adjusting of small trimmer coils connected to the taps of the main tuning coil.

In order that correct matching of the aerial circuit to the power amplifier should be possible under all transmitting conditions the coupling capacitor consists of two capacitors, one being fixed connected up in the circuit, the other being switched in and out according to aerial resistance. In order to keep the total tuning capacity of the anode circuit constant part of the anode-cathode capacity is made up of a series capacitor, a compensating capacitor, one fixed connected up and another which is switched into the circuit when the corresponding coupling capacitor is switched out of the circuit - and vice versa.

For details concerning adjustment of coupling and compensating capacitors see paragraph: Operation.

The setting of the above mentioned 8 frequencies takes place by a single 8 position switch.

The aerial circuit is tuned separately by means of a continuously variable loading coil (so called variometer) with a single tap, for tuning in the whole range 410 - 512 kc/s to aerials with capacities between 300 and 750 pF and at 500 kc/s even to aerials having a capacity of but 200 pF.

Artificial aerial with a capacity of about 500 pF and a resistance of about 3 ohms is incorporated in the transmitter proper and a switch provided for choosing between artificial and outdoor aerial. A thermocouple ammeter reads the aerial current in both cases.

The transmitter is constructed for A1 and A2 transmission. Modulation (when transmitting A2) takes place as combined anode and screen grid modulation in the power amplifier, the modulation power being supplied by a modulator in the coastal telephony section, A 218, of the complete transmitter.

As mentioned above keying takes place by means of a keying relay which by key down condition shorts a resistor in a voltage divider across the high tension. All cathodes are brought to the tap on the voltage divider which is grounded at key down. At key up all cathodes adopt a positive voltage of about 90 volts in proportion to chassis while the grids keep their voltage (Zero or minus filament voltage). In this way all plate and screen grid currents are cut completely off.